Chemistry Pacing Guide **2013-2014**
Lynchburg City Schools **Curriculum Framework: General Chemistry**

TEXT: Chemistry – Matter and Change , McGraw-Hill, 2005.

1st 9 WEEKS (8/26-10/25)

SOL	Enabling Objective: Description	Text	Recommended Activities (hyperlinks, ESS, CHEMLABS on R drive)	# days to teach
				44 days
2nd day of school PRE-TEST (for Teacher Evaluation & School Improvement: short 1 day test of essential skills)				***1 day***
CH.1ei	**Chemistry & Matter** ***The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include*** e) accurate recording, organization, and analysis of data through repeated trials; i) construction and defense of a scientific viewpoint	1-1, 1-2, 1-3, 1-4	**LAB:** *Qualitative Observations of a Chemical Reaction [R drive] *Scientific Method and the 'Phlogiston Theory'- reading for content [R drive] **APPLETS/VIDEOS:** Shakashiri Battery Demonstration Video (3 min) Scientific Vs. Nonscientific Writing Practice	6 days
CH.1d-i	**Data Analysis** ***The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include*** d) manipulation of multiple variables, using repeated trials; e) accurate recording, organization, and analysis of data through repeated trials; f) mathematical and procedural error analysis; g) mathematical manipulations including SI units, scientific	2-1, 2-2, 2-3, 2-4	**LABS:** *Quantitative Observations of a Chemical Reaction [R drive] *Density of a Metal w/ Graph and Error Analysis [R drive] **H/W:** Dim. Analysis – practice and problem sheet w/ unit conversions and	7 days

	notation, linear equations, graphing, ratio and proportion, significant digits, and dimensional analysis; h) use of appropriate technology including computers, graphing calculators, and probeware, for gathering data, communicating results, and using simulations to model concepts; i) construction and defense of a scientific viewpoint		'word' problems **APPLETS/VIDEOS:** Sig Fig Practice Sig Fig Practice Quiz	
	Changes & Properties of Matter			
CH.1a-c	***The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include*** a) designated laboratory techniques; b) safe use of chemicals and equipment; c) proper response to emergency situations	3-1, 3-2, 3-3	**LAB**: *Physical and Chemical Changes **LABS**: ***Chromatography** of markers - Science Stuff: Paper Chromatography ***Dissolving** techniques for analysis of cold packs - University of Manitoba CRYSTAL | Links **H/W:** Dim. Analysis – practice and problem sheet w/ 'word' problems - % and concentrations **APPLETS/VIDEOS:** Classification of Matter Applet Conservation of Mass Demos	11 days
CH.2h	***The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of*** h) chemical and physical properties;			
	Structure of an Atom			
CH.2a-ci	***The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of*** a) average atomic mass, mass number, and atomic number; b) isotopes, half lives, and radioactive decay;	4-1, 4-2, 4-3	**LAB**: ***Simulation –**Isotopes of 'Pennium' [R drive] **H/W:** Practice atomic structure w/ chart for elements # 1-36	8 days

	c) mass and charge characteristics of subatomic particles i) historical and quantum models		**Video Series:** The Periodic Table for Students – Atomic Structure and the Periodic Table [purchase] **APPLETS/VIDEOS:** Atomic History Webquest Powers of Ten Video (9 min) Cathode Ray Video (1 min) Gold Foil Video (1 min) Types of Radiation Animation (1 min) World of Chemistry Atom Video (30 min) Subatomic Particle Game Atom Builder Puzzle Atom Builder with Charge and Symbols Create and Measure Isotopes Applet	
CH.6a	***The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include*** a) unique properties of carbon that allow multi-carbon compounds; and			
	Electrons in Atoms			
CH.2gi	***The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of*** g) electron configurations, valence electrons, and oxidation numbers; i) historical and quantum models.	5-1, 5-2, 5-3	**LAB**: *Flame Tests - Download: Chem fax flinn scientific at Marks Web of Books and Manuals **H/W:** Practice electron notations w/ chart for elements # 1-20 **APPLETS/VIDEOS:** EM Spectrum Applet Bohr vs Quantum Model Animation Orbits and Spectra Virtual Lab (e2020) (teacher.education2020.com, go to course	8 days

		structure, EOC Chemistry, models of atom, view lab) Heisenberg Soccer Ball Animation (1 min) Bohr vs Quantum Model Animation Electron Configuration Ladder Electron Configuration Visualizer	
	Flex days/Remediation		3 days

Reflection notes:

2nd 9 WEEKS (10/29-1/17)				
SOL	**Enabling Objective: Description**	**Text**	**Recommended Activities (e.g., applets, ESS, labs)**	**# days to teach**
				45 days
	Periodic Table & Periodic Law			
CH.2d-f	***The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of*** d) families or groups; e) periods; f) trends including atomic radii, electronegativity, shielding effect, and ionization energy;	6-1, 6-2, 6-3	**H/W:** Provide a periodic table for students; students label parts of a blank chart. **LAB**: *Activity Series for Metals [R drive] **APPLETS/VIDEOS:** Periodic Table Trends Atomic Radius Visualizer Mendeleev Organization Activity World of Chemistry Periodic Table Video (30 min) Video Periodic Table	5 days
	Elements			
CH.2d-h	***The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of*** d) families or groups; e) periods; h) chemical and physical properties;	7-1, 7-2, 7-3, 7-4	**APPLETS/VIDEOS:** Element Song Element Discovery Date Applet Abundance and Uses Periodic Table	6 days

	Ionic Compounds			
CH.3ad	***The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include*** a) nomenclature; d) bonding types;	8-1, 8-2, 8-3, 8-4	**LAB:** *Make ionic 'notecards' w/charges and match ions to make neutral compounds [R drive] **H/W:** Memorize polyatomic ion; practice names and formulas for ionic compounds **APPLETS/VIDEOS:** Ionic Charge Balancer Ionic Bonding Applet (e2020) (teacher.education2020.com, go to course structure, EOC Chemistry, Formation and Nature of Ionic Bonds Lab)	9 days
	Covalent Bonding			
CH.3ad	***The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include*** a) nomenclature; d) bonding types;	9-1, 9-2, 9-3, 9-4, 9-5	**LAB:** *Models of Covalent Molecules (use molecular model kits) [R drive] **H/W:** Practice names and formulas for covalent compounds **APPLETS/VIDEOS:** World of Chemistry Bonding Video (30 min) Conductivity Tester Applet Covalent Bonding Applet (e2020) (in nature of	10 days
CH. 6a	***The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include*** a) unique properties of carbon that allow multi-carbon compounds			

			covalent bonding lab) Bond Polarity Visualizer Applet VSEPR Animation VSEPR Applet (Visualize and Build)	
	Chemical Reactions			
CH.3bce CH. 6b	***The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include*** b) balancing chemical equations; c) writing chemical formulas; e) reaction types; ***The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include*** a) unique properties of carbon that allow multi-carbon compounds; and b) uses in pharmaceuticals and genetics, petrochemicals, plastics, and food.	10-1, 10-2, 10-3, 10-4	**LABS:** *Writing Equations and Predicting Products [R drive] *Double Replacement Reactions [R drive] **H/W:** Practice balancing and determining types of reactions **APPLETS/VIDEOS:** Shakashiri Reaction Videos Interactive Balancing Tutorial (table method) Visual Balancer Visual Balancing Game Activity Series Applet	12 days
	Cumulative Semester Exams --- *(recommend multiple choice questions adapted from previous SOLs & short answer, diagramming, & problem-solving items)*			2 days
	Flex days/Remediation			1 day

Reflection notes:

3rd 9 WEEKS (1/22-3/28)				
SOL	**Enabling Objective: Description**	**Text**	**Recommended Activities (e.g., applets, ESS, labs)**	**# days to teach**
				48 days
	Mole Conversions			
CH.4a	***The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include*** a) Avogadro's principle and molar volume; b) stoichiometric relationships;	11-1, 11-2, 11-3, 11-4, 11-5	**LABS:** * % Oxygen in Potassium Chlorate *% Sugar in Bubble Gum [all on R drive] *Formula for a Hydrate [TEXT: Chap. 11] **H/W:** Practice mole/mass/particle conversions, theoretical % composition and empirical formula calculations **APPLETS/VIDEOS:** Formula of A Hydrate Animation Stoichiometry Flip Tile Applet (e2020) (in Arithmetic of Equations Lab)	13 days
	Stoichiometry			
CH.4b	***The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include*** b) stoichiometric relationships;	12-1, 12-2, 12-3, 12-4	**LABS:** *Recovery of Copper to determine a mole ratio for balanced equation *Recovery of a Salt from a	13 days

			neutralization reaction [all on R drive] *S'more Stoichiometry Lab **H/W:** Practice using balanced equation to predict moles of product **APPLETS/VIDEOS:** Stoichiometry Tutorial and Problems Three Step Stoichiometry Tutorial Limiting Reactant Applet (e2020) (Limiting Reagent and Percent Yield Lab) Limiting Reactant Applet (sandwiches and reactions)	
CH.5b, d	**States of Matter** ***The student will investigate and understand that the phases of matter are explained by kinetic theory and forces of attraction between particles. Key concepts include*** b) partial pressure and gas laws; d) phase changes;	13-1, 13-2, 13-3, 13-4, 13-5	**LABS:** *Heating Curve for Water w/labeled graph *Surface Tension of Water and various Solutions [all on R drive] **APPLETS/VIDEOS:** States of Matter Animation Phase Change Plot Applet Vapor Pressure and Temperature Graph Phase Diagram Applet	11 days

Gases

CH.5a, b	***The student will investigate and understand that the phases of matter are explained by kinetic theory and forces of attraction between particles. Key concepts include*** a) pressure, temperature, and volume; b) partial pressure and gas laws;	14-1, 14-2, 14-3, 14-4, 14-5, 14-6	**LABS:** * Boyle's Law 'By the Book' * Molar Volume of a Gas [all on R drive] **DEMOS:** * Avogadro's, Boyle's, Charles', Gay-Lussac's Law [See gas law demos.doc on R drive] * 'Crushed Can' [Soda Can Gas Lab/Demo and R drive] **H/W:** Practice calculations with Boyle's, Charles' and Ideal Gas Laws **APPLETS/VIDEOS:** Other Gas Law Graph and Simulation Applets Dalton's Law Applet Ideal Gas Applet Can Crush Animation	7 days
	Flex days/Remediation			4 days

Reflection notes:

4th 9 WEEKS (4/1-6/6)				
SOL	**Enabling Objective: Description**	**Text**	**Recommended Activities (e.g., applets, ESS, labs)**	**# days to teach**
				43 days
	Gases			
CH.5a, b	***The student will investigate and understand that the phases of matter are explained by kinetic theory and forces of attraction between particles. Key concepts include*** a) pressure, temperature, and volume; b) partial pressure and gas laws;	14-1, 14-2, 14-3, 14-4, 14-5, 14-6	**LABS:** * Boyle's Law 'By the Book' * Molar Volume of a Gas [all on R drive] **DEMOS:** * Avogadro's, Boyle's, Charles', Gay-Lussac's Law [See gas law demos.doc on R drive] * 'Crushed Can' [Soda Can Gas Lab/Demo and R drive] **H/W:** Practice calculations with Boyle's, Charles' and Ideal Gas Laws **APPLETS/VIDEOS:** Other Gas Law Graph and Simulation Applets Dalton's Law Applet Ideal Gas Applet Can Crush Animation	6 days

	Solutions			
CH.4c CH.5c, g	***The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include*** c) solution concentrations; ***The student will investigate and understand that the phases of matter are explained by kinetic theory and forces of attraction between particles. Key concepts include*** c) vapor pressure; g) colligative properties.	15-1, 15-2, 15-3, 15-4, 15-5	**LAB:** *Solubility Curves [R drive] **H/W:** Practice calculations using molarity, molality, and mole fraction concentrations **APPLETS/VIDEOS:** Solvation Animation (1 min) Supersaturation Clip (1 min) Solubility Rap (3.5 min) Changing Concentration Applet Heats of Solution Applet Colligative Properties Applet (Boiling and Freezing Point)	6 days
	Energy & Chemical Change			
CH.3e, f CH. 5 e, f	***The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include*** e) reaction types; f) reaction rates, kinetics, and equilibrium ***The student will investigate and understand that the phases of matter are explained by kinetic theory and forces of attraction between particles. Key concepts include*** e) molar heats of fusion and vaporization; f) specific heat capacity;	16-1 16-2 16-3 16-4 16-5	**LABS:** *Heat of Solution *Heat of Fusion [R drive] **APPLETS/VIDEOS:** World of Chemistry Energy Video (30 min) Elephant Toothpaste Demo Simple Heat Capacity Applet (could use by itself or with further links)	Mini Topic = ~3 days

			Heat capacity of Copper Applet Virtual Calorimetry Lab Rate of Reaction Song Collision Theory Applet Surface Area Rate Animation Concentration Rate Animation Temperature Rate Animation Reaction Rate Applet (e2020) (Rates of Reaction Lab) T and Solubility Virtual Lab Reversible Reaction Applet Phase Change Equilibrium Applet (e2020) (phase eq lab. Also fpd) Le Chatlier Cobalt Problem Lab	
	Acids & Bases			
CH.3e	***The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include*** e) reaction types	19-1, 19-2, 19-3, 19-4, 19-5	**LABS:** *Test various common and lab acids and bases with paper and liquid acid/base indicators **H/W:** Practice calculations for [H+], pH, [OH-] and pOH **APPLETS/VIDEOS:** Universal Indicator Rainbow Demo Simple Indicator Lab Weak Acid Titration Virtual Lab Virtual Acid/Base Titration Advanced Titration Virtual Lab	3-4 days
CH.4d	***The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include*** d) acid/base theory; strong electrolytes, weak electrolytes, and nonelectrolytes; dissociation and ionization; pH and pOH; and the titration process.			

	POST-TEST (for Teacher Evaluation & School Improvement—use same test as PRE-TEST)			1 day
	SOL REVIEW (BEFORE any SOL testing) **Note: Within the review period, teachers may do mini lessons covering energy, enthalpy, equilibrium, kinetics, and organic chemistry to break up the basic review and prepare students for those topics on the SOL.**			13-16 days
	Acids & Bases			
CH.3e	***The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include*** e) reaction types	19-1, 19-2, 19-3, 19-4, 19-5	**LABS:** *Test various common and lab acids and bases with paper and liquid acid/base indicators **H/W:** Practice calculations for [H+], pH, [OH-] and pOH **APPLETS/VIDEOS:** Universal Indicator Rainbow Demo Simple Indicator Lab Weak Acid Titration Virtual Lab Virtual Acid/Base Titration Advanced Titration Virtual Lab	4-5 days
CH.4d	***The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include*** d) acid/base theory; strong electrolytes, weak electrolytes, and nonelectrolytes; dissociation and ionization; pH and pOH; and the titration process.			
	Final exam			2 days

Reflection notes:

Reporting Categories are the same as well as the number of items within each category. However, some NEW content has been added or OLD content has been moved. See the changes in the Blueprint summary table and the SOL crosswalk below.

Blueprint Summary		**2003**			**2010**
Reporting Category	**SOLs** -----*(significant changes are in bold print).* See Crosswalk, Brief Notes below, & Curriculum framework for details	**#items**	**% of test**	**#items**	**% of test**
Scientific Investigation	CH.1a-i	10	20%	10	20%
Atomic Structure & Periodic Relationships	CH. 2a-l, **CH.6a** New Content = CH.6a	8	16%	8	16%
Chemical Formulas & Reactions	CH.3a-f, **CH.6b** New content = CH.6b	16	32%	16	32%
Molar Relationships	CH. 4a-d	8	16%	8	16%
Phases of Matter & Kinetic Molecular Theory	CH. 5a-g	8	16%	8	16%

Brief List of SOL Changes: Science Crosswalk between 2003 and 2010 standards

-**CH.1i,** Redundant content was removed (the nature of science).
-**CH.1j,** New content was added (*the use of current applications to reinforce chemistry concepts).*
-**CH.2e,** Part of the content (series) was removed
-CH.3f, Related content was moved from CH.4f (chemical equilibrium) and added to the existing bullet.
-old CH.4c, Content (partial pressure) was moved to CH.5b.
-old CH.4d, Content (gas laws) was moved to CH.5b.
-old CH.4f, Content (chemical equilibrium) was moved to CH.3f.
-CH.5b, Content was moved from CH.4c (partial pressure) and CH.4d (gas laws).
-CH.6a-b, New content was added.

CH.6 The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include
a) unique properties of carbon that allow multi-carbon compounds; and
b) uses in pharmaceuticals and genetics, petrochemicals, plastics, and food.

Removed 2003 Chemistry SOL Content:
Minor content in CH.2e was removed (series).

Chemistry SOL Course Content Overview

1st 9 weeks=	44 days
Chemistry & Matter	**6 days**
Data Analysis	**7 days**
Changes & Properties of Matter	**11 days**
Structure of an Atom	**8 days**
Electrons in Atoms	**8 days**
2nd 9 weeks=	45 days
Periodic Table & Periodic Law	**8 days**
Elements	**6 days**
Ionic Compounds	**8 days**
Covalent Bonding	**10 days**
Chemical Reactions	**12 days**
3rd 9 weeks=	48 days
Mole Conversions	**13 days**
Stoichiometry	**13 days**
States of Matter	**11 days**
Gases	**7 days**
4th 9 weeks=	43 days
Gases	**6 days**
Solutions	**7-8 days**
Energy & Chemical Change	**6-7 days**
Acids & Bases	**8 days**