VAN BUREN SCHOOL DISTRICT
CHEMISTRY CURRICULUM

DAYS	CHAP	TOPIC	SUB-TOPICS	LABS	FRAMEWORKS	CORRELATION TO ACT TEST
8 ** 90 Minute Block Classes **	1	CHEMICAL FOUNDATIONS	• Explain why chemistry is important. • List and describe the steps of the scientific method. • Discuss Science and Ethics. • Evaluate how Technology and Science help each other. • Explain the safety rules of the laboratory. • Identify the metric units of measurements. Explain what causes uncertainty in measurements. • Compare accuracy and precision. • Explain how to use significant digits and scientific notation. • Calculate percent error. • Define density and explain how it is calculated. • Use dimensional analysis and conversion factors.	Density Lab Measurement Lab Glass Lab	NS.32.C.1 Explain why science is limited to natural explanations of how the world works NS.32.C.2 Compare and contrast *hypotheses, theories*, and *laws* NS.32.C.3 Compare and contrast the criteria for the formation of scientific *theory* and scientific *law* NS.32.C.4 Distinguish between a scientific *theory* and the term *"theory"* used in general conversation NS.32.C.5 Summarize the guidelines of science: ▪ explanations are based on observations, evidence, and testing ▪ *hypotheses* must be testable ▪ understandings and/or conclusions may change with additional empirical data ▪ scientific knowledge must have peer review and verification before acceptance NS.36.C.1 Compare and contrast chemistry concepts in pure science and applied science NS.36.C.2 Discuss why scientists should work within ethical parameters NS.33.C.1 Develop and explain the appropriate	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions

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					procedure, controls, and variables (dependent and independent) in scientific experimentation NS.34.C.1 Recognize that theories are scientific explanations that require empirical data, verification, and peer review NS.34.C.2 Understand that scientific theories may be modified or expanded based on additional empirical data, verification, and peer review NS.36.C.4 Explain how the cyclical relationship between science and technology results in reciprocal advancements in science and technology	
8	2	ENERGY AND MATTER	• Name three basic forms of energy. • State the law of conservation of energy. • Compare the Fahrenheit, Celsius, and Kelvin temperature scales. • Explain what is meant by absolute zero. • states of matter. • Compare physical and chemical properties of matter. • State the law of conservation of matter. • Explain the difference between an element and a compound. • Compare heterogeneous and homogeneous mixtures. • Describe several techniques to separate mixtures.	Mixture Lab Chromatography Lab	NS.33.C.2 Research and apply appropriate safety precautions (refer to Arkansas Safety Lab Guide) when designing and/or conducting scientific investigations NS.33.C.3 Identify sources of *bias* that could affect experimental outcome NS.33.C.4 Gather and analyze data using appropriate summary statistics NS.35.C.1 Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables NS.35.C.2 Use appropriate equipment and technology as tools for solving problems NS.33.C.5	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions

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					Formulate valid conclusions without *bias* NS.33.C.6 Communicate experimental results using appropriate reports, figures, and tables NS.35.C.3 Utilize technology to communicate research findings P.6.C.1 Compare and contrast *matter* based on uniformity of particles: • pure substances • *solutions* • heterogeneous mixtures P.6.C.2 Distinguish between *extensive* and *intensive physical properties* of *matter* P.6.C.3 Separate homogeneous mixtures using physical processes: • *chromatography*	
6	3	ATOMIC STRUCTURE	• Define the term atom. • List the postulates of Dalton's theory. • Discuss how atoms are related to electricity. • Explain what studies of cathode rays and radioactivity revealed about atoms. • Discuss Rutherford's alpha-scattering experiment and how it showed the existence of the nucleus. • Name and describe the three subatomic particles. • Determine the number of protons, neutrons, and electrons in an atom or ion.		AT.1.C.1 Summarize the discoveries of the *subatomic particles* • Rutherford's gold foil • Chadwick's discovery of the neutron • Thomson's cathode ray • Millikan's Oil Drop AT.1.C.2 Explain the historical events that led to the development of the current *atomic theory.* AT.2.C.1 Analyze an atom's particle position, arrangement, and charge using: • proton • neutron	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions

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			• Define isotopes and atomic mass. • Describe the changes that accompany nuclear reactions. • Define radioactivity. • Describe a wave in terms of its frequency, wavelength, speed, and amplitude. • Identify the major regions of the electromagnetic spectrum. • Explain what is meant by a quantum of energy. • Relate the energy of radiation to it's frequency. • Distinguish between a continuous spectrum and a line spectrum. • State the main idea in Bohr's model of the atom.		• electron AT.2.C.2 Compare the magnitude and range of *nuclear forces* to magnetic forces and gravitational forces AT.2.C.3 Draw and explain nuclear symbols and hyphen notations for *isotopes:* • nuclear symbol: ${}^{A}_{Z}X$ Where Hyphen notation: $X-A$ Where X = element symbol; A = the mass number; Z = atomic number; the number of neutrons = $A-Z$ AT.2.C.4 Derive an *average atomic mass* AT.2.C.5 Determine the arrangement of *subatomic particles* in the *ion(s)* of an *atom* P.7.C.1 Demonstrate an understanding of the *Law of Multiple Proportions* NC.30.C.1 Describe the following radiation emissions: • alpha particles • beta particles • gamma rays • positron particles • NC.30.C.3 Compare and contrast *fission* and *fusion* NC.30.C.4 Apply the concept of half life to *nuclear decay*	

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5	4	ELECTRON CONFIGURATION	• Describe atomic orbitals in terms of their shape, size, and energy. • Determine the electron configurations of several elements using the principles of orbital energy, orbital capacity, and electron spin.	Electron Cloud Probability Lab	AT.3.C.1 Correlate emissions of visible light with the arrangement of electrons in *atoms:* • quantum • $c = v\lambda$ Where $v =$ *frequency*; $\lambda = wavelength$ AT.3.C.2 Apply the following rules or principles to model electron arrangement in *atoms*: • *Aufbau Principle* (diagonal filling order) • *Hund's Rule* • *Pauli's Exclusion Principle* AT.3.C.3 Predict the placement of *elements* on the Periodic Table and their properties using electron configuration AT.3.C.4 Demonstrate electron placement in *atoms* using the following notations: • *orbital notations* • *electron configuration notation* • *Lewis electron dot structures*	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions
4	5	THE PERIODIC TABLE	• State the periodic law. • Discuss the contributions of Mendeleev to the periodic table. • Explain why elements in a group have similar properties. • Identify the four blocks on the periodic table. Define the term periodic trend. • Identify four important periodic trends and explain how each reflects the electron configurations of the elements.		P.4.C.1 Compare and contrast the historical events leading to the evolution of the Periodic Table P.4.C.2 Describe the arrangement of the Periodic Table based on electron filling orders: • Groups • Periods P.4.C.3 Interpret periodic trends: • *atomic radius* • *ionic radius* • *ionization energy* • *electron affinities* • *electronegativities*	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions

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1	6	GROUPS OF ELEMENTS	• Describe and Compare important alkali & alkaline earth metals. • Give several examples of the uses of transition metals. • Describe the characteristics of the lanthanides and actinides. • Describe the trends in behavior of the elements as you proceed from Group 3A to Group 8A in the periodic table. • Explain the roles played by oxygen, carbon, and nitrogen in your world. • Describe some of the properties of hydrogen			• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions
8	7	CHEMICAL FORMULAS AND BONDING	• Describe the characteristics of an ionic bond. • State the octet rule. • Describe the characteristics of a covalent bond. • Describe the difference between polar and nonpolar covalent bonds. • Write names for ionic compounds, molecular compounds, and acids. • Describe the VSEPR theory. • Draw Lewis Dot Diagrams		P.5.C.1 Write formulas for *binary* and *ternary compounds:* • *IUPAC* system • Greek prefixes • Polyatomic *ions* P.5.C.2 Name *binary* and *ternary compounds* AB.20.C.1 Name and write formulas for *acids*, *bases* and *salts:* • *binary acids* • *ternary acids* • *ionic compounds* P.5.C.3 Predict the name and symbol for newly discovered *elements* using the *IUPAC* system B.8.C.1 Determine *ion* formation tendencies for groups on the Periodic Table: • *main group elements* • *transition elements*	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions

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					B.8.C.2 Derive *formula units* based on the charges of *ions* B.8.C.3 Use the *electronegativitiy* chart to predict the *bonding* type of *compounds:* • *ionic* • *polar covalent* • *non-polar covalent* B.9.C.1 Draw *Lewis structures* to show *valence electrons* for *covalent bonding*: • lone pairs • shared pairs	
4	8	MOLECULAR SHAPE	• Identify the common shapes of small molecules. • Explain what determines the polarity of a molecule. • Explain why water is a polar molecule.	Molecular Shape Lab	B.9.C.3 Predict the polarity and geometry of a molecule based upon shared electron pairs and lone electron pairs: • *VSEPR Model* B.10.C.1 Explain the properties of metals due to delocalized electrons: • *molecular orbital model*	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions
5	9	CHEMICAL REACTIONS AND EQUATIONS	• Describe the characteristics of a chemical reaction. • Write balanced chemical equations. • Classify chemical reactions.		S.12.C.1 Balance *chemical equations* when all *reactants* and *products* are given S.12.C.2 Use balanced reaction equations to obtain information about the amounts of *reactants* and *products* S.14.C.1 Given the *products* and *reactants* predict *products* for the following types of *reactions:* • *synthesis*	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses,

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					• *decomposition* • *single displacement* • *double displacement* • *combustion*	models, or predictions
7	10	THE MOLE	• Define a mole and describe its importance. • Identify and use Avogadro's number. • Define molar mass and explain how it relates the mass of a substance to the number of particles in that substance. • Convert among the number of particles, moles, and mass of a substance. • Describe molar volume and use it to solve problems. • Find the percentage composition of a given formula. • Use percentage composition to determine the formula of an unknown sample. • Find the empirical and molecular formulas.	Percent Composition Lab Hydrate lab	S.13.C.1 Apply the *mole* concept to calculate the number of particles and the amount of substance: Avogadro's constant = 6.02×10^{23} S.13.C.2 Determine the *empirical* and *molecular formulas* using the molar concept: • *molar mass* • *average atomic mass* • *molecular mass* • formula mass	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions

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6	11	THE MATHEMATICS OF CHEMICAL EQUATIONS	• Define stoichiometry and describe its importance. • Relate stoichiometry to balanced chemical equations. • Identify and solve different types of stoichiometry problems. • Determine the limiting reactant of a chemical reaction. • Calculate the amount of product formed in a chemical reaction when reactants are present in nonstoichiometric proportions.	Percent Yield Lab	S.12.C.2 Use balanced reaction equations to obtain information about the amounts of *reactants* and *products* S.12.C.3 Distinguish between *limiting reactants* and *excess reactants* in balanced reaction equations S.12.C.4 Calculate *stoichiometric* quantities and use these to determine theoretical yields GL.18.C.1 Calculate volume/*mass* relationships in balanced *chemical reaction equations*	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions
4	12	HEAT IN CHEMICAL REACTIONS	• Distinguish between exothermic and endothermic reactions. • Explain what is meant by enthalpy and enthalpy change. • Define Standard enthalpy change and explain how it is used. • State Hess's law. • Apply Hess's law to determine the heat for a reaction. • Describe how a calorimeter determines heats of reactions.	Specific heat Lab	KE.23.C.4 Define specific heat capacity and its relationship to calorimetric measurements: $q = m(\Delta T)C_p$	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions
6	13	GASES	• Describe the kinetic-molecular theory and explain how it accounts for observed gas behavior. • Explain what gas pressure means and describe how it is	Grahams Law of Effusion Lab	GL.16.C.1 Demonstrate the relationship of the *kinetic theory* as it applies to *gas* particles: • *molecular motion* • *elastic collisions* • *temperature* • pressure	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data

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			measured. • State the gas laws. • Discuss the significance of the ideal gas equation. • Compare ideal and real gases. • Relate gas density to temperature and molar mass.		• ideal gas GL.16.C.2 Calculate the effects of *pressure, temperature,* and volume on the number of *moles* of *gas* particles in *chemical reactions* GL.17.C.1 Calculate the effects of *pressure, temperature,* and volume to *gases using:* Avodadro's Law, Boyle's Law, Charles, Law, Combined Law, Dalton's Law, Graham's Law, Guy-Lussac Law,, Ideal Gas Law	• Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions
4	14	LIQUIDS AND SOLIDS	• Explain how the kinetic-molecular theory accounts for the physical properties of liquids and solids. • Describe the different types of intermolecular forces. • Define viscosity and surface tension and explain their relationship to intermolecular forces. • Compare crystalline and amorphous substances. • Relate the structure and bonding in the four categories of solids to the properties they exhibit. • Describe vaporization, condensation, and boiling. • Describe freezing and melting. • Identify the features of a phase diagram.	Enthalpy of Fusion Lab	B.11.C.1 Distinguish between *amorphous* and *crystalline solids* B.11.C.2 Compare and contrast the properties of *crystalline solids:* • ionic • covalent network • covalent molecular • metallic	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions
6	15	SOLUTIONS	• Describe the properties of solutions. • Identify the different types of solutions. • Measure the concentration of		S.15.C.1 Distinguish between the terms *solute*, *solvent*, *solution* and *concentration* S.15.C.3	• Interpretation of data and other information. • Data Representation • Identification of patterns, trends, and

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			solutions in terms of molarity. • Differentiate among saturated, unsaturated, and supersaturated solutions. • Explain how solutions form. • Define solubility and describe the factors that affect solubility. • Describe the factors that affect the rate at which a solute dissolves a solvent. • Define a colligative property of a solution.		Calculate the following concentration expressions involving the amount of *solute* and volume of solution: • *molarity* (M)	relationship of data • Purpose of Experimental procedures. • Process of scientific investigation. • Identification of conclusions, hypotheses, models, or predictions