FATHER DUENAS MEMORIAL SCHOOL
SY 2015-2016
CHEMISTRY SYLLABUS

COURSE TITLE : CHEMISTRY
GRADE LEVEL : 11TH GRADE
TEACHER : MRS. EVANGELINE R. MANGUNE

CHEMISTRY is a science that deals with the study of the compositions and properties of pure substances and mixtures: the changes and reactions that these substances undergo.

COURSE OBJECTIVES:

At the end of this course, the students shall have:

- learned the facts, formulas and principles that compose the high school curriculum.
- understood the basic concepts underlying these facts and principles and their importance in their daily life.
- gained deep understanding of fundamental Chemistry principles.
- develop skills in laboratory experiments.
- developed skills in writing lab reports.
- develop skills in formulating scientific questions based on given topics or observed data.
- developed critical thinking in solving problems.

TEXTBOOKS: Chemistry Matter & Change
Thandi Buthelezi – Laurel Dingrando
Nicholas Hainen – Cheryl Winstrong – Dinah Zike
McGraw Hill
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LAB MANUAL: Chemistry Matter & Change
Glencoe Science

LABORATORY:

1. Laboratory safety agreement form must be signed by student, parent or guardian before a student can participate in laboratory experiments and activities.
2. Laboratory safety and pre-lab will be discussed before starting an experiment or investigation.
3. There is no lab manual prescribed but a collection of experiments from textbook and different sources.

4. After each laboratory experiment, every student is required to turn in a lab report. Students will work in groups, four to five student depending on the size of the class. Each student is required to turn in lab reports. The lab report should include the objectives(s) for the experiment, the problem, the hypothesis, material, procedure, observations, data including graphs and tables, calculations, analysis of results, conclusion and reflection. The reflection should explain what the group did right, the possible source of errors if any, how to correct these errors if they were to do experiment again and the application of what they have learned to daily life.

GRADING SYSTEM

1.	Homework/Classwork	10%
2.	Test (Lab & Lecture)	25%
3.	Lab Work & Lab Reports	30%
4.	Quizzes	10%
5.	Quarter Exams	25%

EXPECTATIONS:

1. Every student is expected to follow school rules (refer to FDMS parent and student handbook). Follow Safety Guidelines specified on Laboratory Manual.

2. Every student is expected to bring textbooks and course materials in class.
   Materials required: notebook specifically for chemistry use onl y, black, blue, red pens, pencil, loose leaf paper, graphing paper, ruler and calculator.

3. Every student is expected to stay on his assigned seat during lecture and assigned work area for labs.

4. Absolutely no food allowed inside the Chem Lab.

NOTE:

1. If the student is absent, it is the student's responsibility to ask teacher for missing work. In addition, student may refer to the Course Outline in the Syllabus.

2. Failure to turn-in homework or classwork on due date, will be marked zero. Late work will be accepted but will be penalized – 10% for each day late. Late work turn-in after four days after the due date will be marked zero.

THE TEXT:

The student textbook is divided into 24 chapters that are organized into THEMES, BIG IDEAS AND MAIN IDEAS of chemistry.

TIME TABLE

First Quarter	Chapters 1-6
Second Quarter	Chapters 7-10
Third Quarter	Chapters 11-14, 18
Fourth Quarter	Chapters 15-17, 19, 21

COURSE OF OUTLINE FOR 1ST QUARTER

Chapter	**Topic**	**Learning Objectives**
1 Introduction to Chemistry	1.1 Story of two substances	- Define substance. - Explain the formation and importance of ozone. - Describe the development of chlorofluorocarbons.
	1.2 Chemistry and Matter	- Compare and contrast mass and weight. - Explain why chemists are interested in a submicroscopic description of matter. - Identify the area of emphasis for various branches of chemistry.
	1.3 Scientific Methods	- Identify the common steps of scientific methods. - Compare and contrast types of data. - Identify types of variables. - Describe the difference between a theory and a scientific law.

	1.4 Scientific Research	- Compare and contrast pure research, applied research and technology. - Apply knowledge of laboratory safety.

Chapter	Topic	Learning Objectives
2 Analyzing Data	2.1 Units and Measurements	- Define SI base units for time, length, mass and temperature. - Explain how adding a prefix changes a unit. - Compare the derived units for volume and density.
	2.2 Scientific Notation and Dimensional Analysis	- Express numbers in scientific notation. - Convert between units using dimensional analysis.
	2.3 Uncertainty in Data	- Define and compare accuracy and precision. - Describe the accuracy of experimental data using error and percent error. - Apply rules for significant figures to express uncertainty in measured and calculated values.
	2.4 Representing Data	- Create graphs to reveal patterns in data. - Interpret graphs.

Chapter	Topic	Learning Objectives
3	3.1 Properties of Matter	- Identify the characteristics of a substance.

Matter – Properties and Changes		- Distinguish between physical and chemical properties. - Differentiate among the physical states of matter.
	3.2 Changes in Matter	- Define physical change and list several common physical changes. - Define chemical change and list several indications that a chemical change has taken place. - Apply the law of conservation of mass to chemical reactions.
	3.3 Mixtures of Matter	- Contrast mixtures and substances. - Classify mixtures as homogeneous or heterogeneous. - List and describe several techniques used to separate mixtures.
	3.4 Elements and Compounds	- Distinguish between elements and compounds. - Describe the organization of elements in the periodic table. - Explain how all compounds obey the laws of definite and multiple proportions.

Chapter	**Topic**	**Learning Objectives**
4 The Structure of the Atom	4.1 Early Ideas About Matter	- Compare and contrast the atomic models of Democritus, Aristotle and Dalton. - Understand how Dalton's theory explains the conversation of mass.
	4.2 Defining the Atom	- Define the atom. - Distinguish between the sub-atomic particles in terms of relative charge and mass.

		- Describe the structure of the atom, including the locations of the sub-atomic particles.
	4.3 How Atoms Differ	- Explain the role of atomic number in determining the identity of an atom. - Define an isotope. - Explain why atomic masses are not whole numbers. - Calculate the number of electrons, protons and neutrons in an atom given its mass number and atomic number.
	4.4 Unstable Nuclei and Radioactive Decay	- Explain the relationship between unstable nuclei and radioactive decay. - Characterize alpha, beta and gamma radiation in terms of mass and charge.

Chapter	**Topic**	**Learning Objectives**
5 Electrons in Atoms	5.1 Light and Quantized Energy	- Compare and wave and particle natures of light. - Define a quantum of energy and explain how it is related to an energy change of matter. - Contrast continuous electromagnetic spectra and atomic emission spectra.
	5.2 Quantum Theory and the Atom	- Compare the Bohr and quantum mechanical models of the atom. - Explain the impact of de Broglie's wave-particle duality and the Heisenberg uncertainty principle on the current view of electrons in atoms. - Identify the relationships among a hydrogen atom's energy levels,

		sublevels, and atomic orbitals.
	5.3 Electron Configuration	- Apply the Pauli exclusion principle, the aufbau principle, and Hund's rule to write electron configurations using orbital diagrams and electron configuration notation. - Define valence electrons and draw electron-dot structures representing an atom's valence electrons.

Chapter	**Topic**	**Learning Objectives**
6 The Periodic Table and Periodic Law	6.1 Development of the Modern Periodic Table	- Trace the development of the periodic table. - Identify key features of the periodic table.
	6.2 Classification of the Elements	- Explain why elements in the same group have similar properties. - Identify the four blocks of the periodic table based on their electron configuration.
	6.3 Periodic Trends	- Compare period and group trends of several properties. - Relate period and group trends in atomic radii to electron configuration.

COURSE OUTLINE FOR 2ND QUARTER

Chapter	Topic	Learning Objectives
7 Ionic Compounds and Metals	7.1 Ion Formation	- Define chemical bond. - Describe the formation of positive and negative ions. - Relate ion formation to electron

		configuration.
	7.2 Ionic Bonds and Ionic Compounds	- Describe the formation of ionic bonds and the structure of ionic compounds. - Generalize about the strength of ionic bonds based on the physical properties of ionic compounds. - Categorize ionic bond formation as exothermic or endothermic.
	7.3 Names and Formulas for Ionic Compounds	- Relate a formula unit of an ionic compound to its composition. - Write formulas for ionic compounds and oxyanions. - Apply naming conversions to ionic compounds and oxyanions.
	7.4 Metallic Bonds and the Properties of Metals	- Describe a metallic bond. - Relate the electron sea model to the physical properties of metals. - Define alloys and categorize them into two basic types.

Chapter	Topic	Learning Objectives
8 Covalent Bonding	8.1 The Covalent Bond	- Apply the octet rule to atoms that form covalent bonds. - Describe the formation of single, double and triple covalent bonds. - Contrast sigma and pi bonds. - Relate the strength of a covalent bond to its bond length and bond dissociation energy.
	8.2 Naming Molecules	- Translate molecular formulas into binary molecular compound names.

		- Name acidic solutions.
	8.3 Molecular Structures	- List the basic steps used to draw Lewis structures. - Explain why resonance occurs and identify resonance structures. - Identify three exceptions to the octet rule and name molecules in which these exceptions occur.
	8.4 Molecular Shapes	- Summarize the VSEPR bonding theory. - Predict the shape of, and the bond angles in, a molecule. - Define hybridization
	8.5 Electronegativity and Polarity	- Describe how electronegativity is used to determine bond type. - Compare and contrast polar and nonpolar covalent bonds and polar and nonpolar molecules. - Generalize about the characteristics of covalently bonded compounds.

Chapter	Topic	Learning Objectives
9 Chemical Reactions	9.1 Reactions and Equations	- Recognize evidence of chemical change. - Represent chemical reactions with equations. - Balance chemical equations.
	9.2 Classifying Chemical Reactions	- Classify chemical reactions. - Identify the characteristics of different classes of chemical reactions.
	9.3 Reactions in Aqueous Solutions	- Describe aqueous solutions. - Write complete ionic and net ionic equations for chemical reactions in aqueous solutions.

		- Predict whether reactions in aqueous solutions will produce a precipitate, water or a gas.

Chapter	Topic	Learning Objectives
10 The Mole	10.1 Measuring Matter	- Explain how a mole is used to indirectly count the number of particles of matter. - Relate the mole to a common everyday counting unit. - Convert between moles and number of representative particles.
	10.2 Mass and the Mole	- Relate the mass of an atom to the mass of a mole atoms. - Convert between number of moles and the mass of an element. - Convert between number of moles and number of atoms of an element.
	10.3 Moles of Compounds	- Recognize the mole relationship shown by a chemical formula. - Calculate the molar mass of a compound. - Convert between the number of moles and mass of a compound. - Apply conversion factors to determine the number of atoms or ions in a known mass of a compound.
	10.4 Empirical and Molecular Formulas	- Explain what is meant by the percent composition of a compound. - Determine the empirical and

		molecular formulas for a compound from mass percent and actual mass data.
	10.5 Formulas of Hydrates	- Explain what a hydrate is and relate the name of the hydrate to its composition. - Determine the formula of a hydrate from laboratory data.

COURSE OUTLINE FOR 3RD QUARTER

Chapter	Topic	Learning Objectives
11 Stoichiometry	11.1 Defining Stoichiometry	- Describe the types of relationships indicated by a balanced chemical equation. - State the mole ratios from a balanced chemical equation.
	11.2 Stoichiometric Calculations	- List the sequence of steps used in solving stoichiometric problems. - Solve stoichiometric problems.
	11.3 Limiting Reactants	- Identify the limiting reactant in a chemical equation. - Identify the excess reactant, and calculate the amount remaining after the reaction is complete. - Calculate the mass of a product when the amounts of more than one reactant are given.
	11.4 Percent Yield	- Calculate the theoretical yield of a chemical reaction from data. - Determine the percent yield for a chemical reaction.
Chapter	Topic	Learning Objectives

12 States of Matter	12.1 Gases	- Use the kinetic-molecular theory to explain the behavior of gases. - Describe how mass affects the rates of diffusion and effusion. - Explain how gas pressure is measured and calculate the partial pressure of a gas.
	12.2 Forces of Attraction	- Describe intramolecular forces. - Compare and contrast intermolecular forces.
	12.3 Liquids and Solids	- Contrast the arrangement of particles in liquids and solids. - Describe the factors that affect viscosity. - Explain how the unit cell and crystal lattice are related.
	12.4 Phase Changes	- Explain how the addition and removal of energy can cause a phase change. - Interpret a phase diagram.

Chapter	Topic	Learning Objectives
13 Gases	13.1 The Gas Laws	- State the relationships among pressure, temperature, and volume of a constant amount of gas. - Apply the gas laws to problems involving the pressure, temperature and volume of a constant amount of gas.
	13.2 The Ideal Gas Law	- Relate number of particles and volume using Avogadro's principle. - Relate the amount of gas present to its pressure, temperature and volume using the ideal gas law.

		- Compare the properties of real and idea gases.
	13.3 Gas Stoichiometry	- Determine volume ratios for gaseous reactants and products by using coefficients from chemical equations.
		- Apply gas laws to calculate amounts of gaseous reactants and products in a chemical reaction.

Chapter	Topics	Learning Objectives
14 Mixtures and Solutions	14.1 Types of Mixtures	- Compare the properties of suspensions, colloids and solutions. - Identify types of colloids and types of solutions. - Describe the electrostatic forces in colloids.
	14.2 Solution Concentration	- Describe concentration using different units. - Determine the concentrations of solutions. - Calculate the molarity of a solution.
	14.3 Factors affecting Solvation	- Describe how intermolecular forces affect solvation. - Define solubility. - Understand what factors affect solubility.
	14.4 Colligative Properties of Solutions	- Describe colligative properties. - Identify four colligative properties of solutions. - Determine the boiling point

		elevation and freezing point depression of a solution.

Chapter	Topic	Learning Objectives
18 Acids and Bases	18.1 Introduction to Acids and Bases	- Identify the physical and chemical properties of acids and bases. - Classify solutions as acidic, basis or neutral. - Compare the Arrhenius, Bronsted-Lowry and Lewis models of acids and bases.
	18.2 Strengths of Acids and Bases	- Relate the strength of an acid or base to its degree of ionization. - Compare the strength of a weak acid with the strength of its conjugate base. - Explain the relationship between the strengths of acids and bases and the values of their ionization constants.
	18.3 Hydrogen Ions and pH	- Explain pH and pOH. - Relate pH and pOH to the ion product constant for water. - Calculate the pH and pOH of aqueous solutions.
	18.4 Neutralization	- Write chemical equations for neutralization reactions. - Explain how neutralization reactions are used in acid-base titrations. - Compare the properties of buffered and unbuffered solutions.

COURSE OF OUTLINE FOR 4TH QUARTER

Chapter	Topic	Learning Objectives
15 Energy and Chemical Change	15.1 Energy	- Define energy. - Distinguish between potential and kinetic energy. - Relate chemical potential energy to the heat lost or gained in chemical reactions. - Calculate the amount of heat absorbed or released by a substance as its temperature changes.
	15.2 Heat	- Describe how a calorimeter is used to measure energy that is absorbed or released. - Explain the meaning of enthalpy and enthalpy change in chemical reactions and processes.
	15.3 Thermochemical Equations	- Write thermochemical equations for chemical reactions and other processes. - Describe how energy is lost or gained during changes of state. - Calculate the heat absorbed or released in a chemical reaction.
	15.4 Calculating Enthalpy Change	- Apply Hess's law to calculate the enthalpy change for a reaction. - Explain the basis for the table of standard enthalpies of formation. - Calculate using thermochemical equations. - Determine the enthalpy change for a reaction using standard enthalpies of formation data.
	15.5 Reaction Spontaneity	- Differentiate between spontaneous and

		nonspontaneous processes. - Explain how changes in entropy and free energy determine the spontaneity of chemical reactions and other processes.

Chapter	Topic	Learning Objectives
16 Reaction Rates	16.1 A Model for Reaction Rates	- Calculate average rates of chemical reactions from experimental data. - Relate rates of chemical reactions to collisions between reacting particles.
	16.2 Factors Affecting Reaction Rates	- Identify factors that affect the rates of chemical reactions. - Explain the role of a catalyst.
	16.3 Reaction Rate Laws	- Express the relationship between reaction rate and concentration. - Determine reaction orders using the methods of initial rates.
	16.4 Instantaneous Reaction Rates and Reaction Mechanism	- Calculate instantaneous rates of chemical reactions. - Understand that many chemical reactions occur in steps. - Relate the instantaneous rate of a complex reaction to its reaction mechanism.

Chapter	Topic	Learning Objectives
17 Chemical Equilibrium	17.1 A state of Dynamic Balance	- List of characteristics of chemical equilibrium. - Write equilibrium expressions for systems that are at equilibrium. - Calculate equilibrium constants from concentration data.

	17.2 Factors Affecting Chemical Equilibrium	- Describe how various factors affect chemical equilibrium. - Explain how Le Chatelier's principle applies to equilibrium systems.
	17.3 Using Equilibrium Constants	- Determine equilibrium concentration of reactants and products. - Calculate the solubility of a compound from its solubility product constant. - Explain the common ion effect.

Chapter	Topics	Learning Objectives
19 Redox Reactions	19.1 Oxidation and Reduction	- Describe the processes of oxidation and reduction. - Identify oxidizing and reducing agents. - Determine the oxidation number of an element in a compound. - Interpret redox reactions in terms of change in oxidation state.
	19.2 Balancing Redox Equations	- Relate changes in oxidation number to the transfer of electrons. - Use changes in oxidation number to balance redox equations. - Balance net ionic redox equations using the oxidation-number method.

Chapter	Topic	Learning Objectives
21	21.1 Introduction to	- Explain the terms organic

Hydrocarbons	Hydrocarbons	compound and organic chemistry. - Identify hydrocarbons and the models used to represent them. - Distinguish between saturated and unsaturated hydrocarbons. - Describe where hydrocarbons are obtained and how they are separated.
	21.2 Alkanes	- Name alkanes by examining their structures. - Draw the structure of an alkane when given its name. - Describe the properties of alkanes.
	21.3 Allkenes and Alkynes	- Compare the properties of alkenes and alkynes with those of alkanes. - Describe the molecular structures of alkenes and alkynes. - Name an alkene or alkyne by examining its structure. - Draw the structure of an alkene or alkyne by analyzing its name.
	21.4 Hydrocarbon Isomers	- Distinguish between the two main categories of isomers – structural isomers and stereoisomers. - Differentiate between geometric isomers with *cis*- and *trans*- prefixes. - Describe the structural variation in molecules that results in optical isomers.
	21.5 Aromatic Hydrocarbons	- Compare and contrast the

		properties of aromatic and aliphatic hydrocarbons. - Explain what a carcinogen is, and list some examples.