K to 12 BASIC EDUCATION CURRICULUM
SENIOR HIGH SCHOOL – SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) SPECIALIZED SUBJECT

Grade: 11
Subject Title: General Chemistry 1 & 2

Semester: 1st and 2nd
No. of Hours/ Semester: 80 hours per semester

Subject Description: Composition, structure, and properties of matter; quantitative principles, kinetics, and energetics of transformations of matter; and fundamental concepts of organic chemistry

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
Quarter 1 – General Chemistry 1					
Matter and its properties 1. the particulate nature of matter 2. states of matter a. the macroscopic b. microscopic view 3. Physical and chemical properties 4. Extensive and intensive properties 5. Ways of classifying matter a. pure substances and mixtures b. elements and compounds c. homogeneous and heterogeneous mixtures 6. Methods of separating mixtures into their component substances	*The learners demonstrate an understanding of:* the properties of matter and its various forms	*The learners:* design using multimedia, demonstrations, or models, a representation or simulation of any of the following: a. atomic structure b. gas behavior c. mass relationships in d. reactions	*The learners:* 1. recognize that substances are made up of smaller particles	**STEM_GC11MP-Ia-b-1**	
			2. describe and/or make a representation of the arrangement, relative spacing, and relative motion of the particles in each of the three phases of matter	**STEM_GC11MP-Ia-b-2**	
			3. distinguish between physical and chemical properties and give examples	**STEM_GC11MP-Ia-b-3**	1. Mortar and Pestle, 150 ml. capacity 2. Spatula, porcelain 3. Watch Glass, Ø 90mm
			4. distinguish between extensive and intensive properties and give examples	**STEM_GC11MP-Ia-b-4**	1. Mortar and Pestle, 150 ml. Capacity 2. Spatula, porcelain 3. Sulfur Powder, 100 grams / bottle 4. Watch Glass, Ø 90mm
			5. use properties of matter to identify substances and to separate them	**STEM_GC11MP-Ia-b-5**	
			6. differentiate between pure substances and mixtures	**STEM_GC11MP-Ia-b-6**	

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			7. differentiate between elements and compounds	**STEM_GC11MP-Ia-b-7**	
			8. differentiate between homogenous and heterogenous mixtures	**STEM_GC11MP-Ia-b-8**	Laser Pointer, dual-function, with dry cells
			9. recognize the formulas of common chemical substances	**STEM_GC11MP-Ia-b-9**	
			10. describe separation techniques for mixtures and compounds	**STEM_GC11MP-Ia-b-10**	1. Evaporating Dish, 75 ml. capacity 2. Filter Paper, ordinary, 24" x 24" sheet 3. Glass Funnel, Ø 50mm (Top Inside Diameter), length of stem: 75mm
			11. compare consumer products on the basis of their components for use, safety, quality and cost	**STEM_GC11MP-Ia-b-11**	
			12. (LAB) apply simple separation techniques such as distillation, chromatography	**STEM_GC11MP-Ia-b-12**	1. Condenser, Liebig-type with accessories 2. Distilling Flask, 250ml
Measurements 1. Accuracy and precision 2. Significant figures in calculations 3. Density measurement	1. the difference between accuracy and precision 2. different sources of errors in measurements		1. differentiate between precision and accuracy	**STEM_GC11MT-Ib-13**	
			2. **(LAB)** Determine the density of liquids & solids	**STEM_GC11MT-Ib-14**	1. Balance, Triple-Beam, 2610-gram capacity 2. Graduated cylinder, 10 ml capacity 3. Graduated cylinder, 100 ml. capacity

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					4. Hydrometer for heavy liquids 5. Hydrometer for light liquids
Atoms, Molecules, and Ions 1. Dalton's atomic theory 2. Basic laws of matter 3. Atomic structure 4. Subatomic particles (protons, electrons, neutrons) 5. Molecules and Ions 6. Chemical Formulas 7. Naming Compounds	1. atomic structure 2. formulas and names of compounds		1. explain how the basic laws of matter (law of conservation of mass, law of constant composition, law of multiple proportion) led to the formulation of Dalton's Atomic Theory	**STEM_GC11AM-Ic-e-15**	
			2. describe Dalton's Atomic Theory	**STEM_GC11AM-Ic-e-16**	
			3. differentiate among atomic number, mass number, and isotopes, and which of these distinguishes one element from another	**STEM_GC11AM-Ic-e-17**	
			4. write isotopic symbols	**STEM_GC11AM-Ic-e-18**	
			5. recognize common isotopes and their uses.	**STEM_GC11AM-Ic-e-19**	
			6. differentiate among atoms, molecules, ions and give examples	**STEM_GC11AM-Ic-e-20**	1. Boric Acid, 100 grams / bottle 2. Calcium Chloride, 100 grams / bottle 3. Copper Sulfate, CuSO4, 100 grams / bottle 4. Potassium Chloride, 100 grams / bottle

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			7. represent compounds using chemical formulas, structural formulas and models	**STEM_GC11AM-Ic-e-21**	
			8. give the similarities and differences between the empirical formula and molecular formula of a compound	**STEM_GC11AM-Ic-e-22**	
			9. name compounds given their formula and write formula given the name of the compound	**STEM_GC11AM-Ic-e-23**	
			10. **(LAB)** Practice chemical nomenclature: writing the chemical formulas of ionic compounds; naming ionic compounds from formulas	**STEM_GC11AM-Ic-e-24**	
Stoichiometry 1. Atomic mass 2. Avogadro's number 3. The mole concept	1. the mole concept in relation to Avogadro's number and mass		1. explain relative atomic mass and average atomic mass	**STEM_GC11S-Ie-25**	
			2. define a mole	**STEM_GC11S-Ie-26**	
			3. illustrate Avogadro's number with examples	**STEM_GC11S-Ie-27**	
			4. determine the molar mass of elements and compounds	**STEM_GC11S-Ie-28**	
			5. calculate the mass of a given number of moles of an element or compound or vice versa	**STEM_GC11S-Ie-29**	
			6. calculate the mass of a given number of particles of an element or compound or vice versa	**STEM_GC11S-Ie-30**	

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4. Percent composition and chemical formulas	2. the relationship of percent composition and chemical formula		1. calculate the percent composition of a compound from its formula	**STEM_GC11PC-If-31**	
			2. calculate the empirical formula from the percent composition of a compound	**STEM_GC11PC-If-32**	
			3. calculate molecular formula given molar mass	**STEM_GC11PC-If-33**	
5. Chemical reactions and chemical equations 6. Types of chemical reactions in aqueous solutions	3. the use of chemical formulas to represent chemical reactions		4. write equations for chemical reactions and balance the equations	**STEM_GC11CR-If-g-34**	
			5. interpret the meaning of a balanced chemical reaction in terms of the law of conservation of mass	**STEM_GC11CR-If-g-35**	
			6. describe evidences that a chemical reaction has occurred	**STEM_GC11CR-If-g-36**	1. Alcohol Burner, glass, 150ml. capacity 2. Alcohol Thermometer, -20ºC to 110ºC 3. Beaker, 100 ml, borosilicate 4. Beaker, 250 ml, borosilicate 5. Beaker, 50 ml, borosilicate 6. Beaker, 500 ml, borosilicate 7. Bunsen Burner, gas-type

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					8. Ferrous Sulfate,100 grams / bottle 9. LPG tank with gas, 11 kg. capacity, regulator & hose assembly 10. Magnesium Ribbon, minimum of 1 meter/roll 11. Potassium Iodide, KI, 100 grams / bottle 12. Reagent Bottle, narrow mouth amber color (250ml. Capacity) 13. Reagent Bottle, wide mouth colorless (250ml. Cap.) 14. Stirring Rod, Ø 6mm x 250mm long 15. Sodium sulfate, 100 grams / bottle 16. Sulfuric Acid, 500 ml / bottle 17. Test Tube, Ø16mm x 150mm long, borosilicate 18. Vials, screw neck vial with cover, 25mL 19. Vials, screw neck vial with

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					cover, 50mL 20. Zinc Chloride, ZnCl2, 100 grams / bottle 21. Zinc Pellets, 100 grams / bottle
			7. **(LAB)** Perform exercises on writing and balancing chemical equations	**STEM_GC11CR-If-g-37**	
7. Mass relationships in chemical reactions	4. the quantitative relationship of reactants and products in a chemical reaction		1. construct mole or mass ratios for a reaction in order to calculate the amount of reactant needed or amount of product formed in terms of moles or mass	**STEM_GC11MR-Ig-h-38**	
			2. Calculate percent yield and theoretical yield of the reaction	**STEM_GC11MR-Ig-h-39**	
			3. explain the concept of limiting reagent in a chemical reaction; identify the excess reagent(s)	**STEM_GC11MR-Ig-h-40**	
			4. calculate reaction yield when a limiting reagent is present	**STEM_GC11MR-Ig-h-41**	
			5. **(LAB)** Determine mass relationship in a chemical reaction	**STEM_GC11MR-Ig-h-42**	
Gases 1. Pressure of a gas a. Units of pressure 2. The Gas laws a. Boyle's Law b. Charles' Law c. Avogadro's Law 3. Ideal Gas Equation	5. the mathematical relationship between pressure, volume, and temperature of a gas		1. define pressure and give the common units of pressure	**STEM_GC11G-Ih-i-43**	
			2. express the gas laws in equation form	**STEM_GC11G-Ih-i-44**	
			3. use the gas laws to determine pressure, volume, or temperature of a gas under certain conditions of change	**STEM_GC11G-Ih-i-45**	Open U-tube Manometer (and Accessories)
			4. use the ideal gas equation to calculate pressure, volume,	**STEM_GC11G-Ih-i-46**	

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			temperature, or number of moles of a gas		
4. Dalton's Law of partial pressures	6. the partial pressures of gases in a mixture		5. use Dalton's law of partial pressures to relate mole fraction and partial pressure of gases in a mixture	**STEM_GC11DL-Ii-47**	
5. Gas stoichiometry	7. quantitative relationships of reactants and products in a gaseous reaction		6. apply the principles of stoichiometry to determine the amounts (volume, number of moles, or mass) of gaseous reactants and products	**STEM_GC11GS-Ii-j-48**	
6. Kinetic molecular theory of gases	8. the behavior and properties of gases at the molecular level		7. explain the gas laws in terms of the kinetic molecular theory of gases	**STEM_GC11KMT-Ij-49**	
			8. relate the rate of gas effusion with molar mass	**STEM_GC11KMT-Ij-50**	
			9. **(LAB)** Demonstrate Graham's law of effusion in an experiment	**STEM_GC11KMT-Ij-51**	
Quarter 2 – General Chemistry 1					
Electronic Structure of Atoms 1. Quantum mechanical description of the atom 2. Schrodinger's model of the hydrogen atom and wave functions 3. Main energy levels, sublevels and orbitals 4. Quantum numbers 5. Electron Configuration a. Aufbau Principle	the quantum mechanical description of the atom and its electronic structure	illustrate the reactions at the molecular level in any of the following: 1. enzyme action 2. protein denaturation 3. separation of components in coconut milk	1. describe the quantum mechanical model of the atom	**STEM_GC11ES-IIa-b-52**	
			2. describe the electronic structure of atoms in terms of main energy levels, sublevels, and orbitals, and relate this to energy	**STEM_GC11ES-IIa-b-53**	
			3. use quantum numbers to describe an electron in an atom	**STEM_GC11ES-IIa-b-54**	
			4. **(LAB)** Perform exercises on quantum numbers	**STEM_GC11ES-IIa-b-55**	
			5. write the electronic configuration of atoms	**STEM_GC11ES-IIa-b-56**	

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b. Pauli Exclusion Principle c. Hund's Rule d. Diamagnetism and Paramagnetism e. Orbital diagrams			6. determine the magnetic property of the atom based on its electronic configuration	**STEM_GC11ES-IIa-b-57**	
			7. draw an orbital diagram to represent the electronic configuration of atoms	**STEM_GC11ES-IIa-b-58**	
			8. **(LAB)** Perform exercises on writing electronic configuration	**STEM_GC11ES-IIa-b-59**	
Electronic Structure and Periodicity 1. The Electron Configuration and the Periodic Table 2. Periodic Variation in Atomic Properties a. Atomic Radius and effective nuclear charge; the shielding effect in many-electron atoms b. Ionic radius c. Ionization energy d. Electron affinity	the arrangement of elements in the periodic table and trends in the properties of the elements in terms of electronic structure		1. explain the periodic recurrence of similar properties among elements in the periodic table in terms of electronic structure	**STEM_GC11ESP-IIc-d-60**	
			2. relate the number of valence electrons of elements to their group number in the periodic table	**STEM_GC11ESP-IIc-d-61**	
			3. compare the properties of families of elements	**STEM_GC11ESP-IIc-d-62**	
			4. predict the properties of individual elements based on their position in the periodic table	**STEM_GC11ESP-IIc-d-63**	
			5. describe and explain the trends in atomic properties in the periodic table	**STEM_GC11ESP-IIc-d-64**	
			6. **(LAB)** Investigate reactions of ions and apply these in qualitative analysis	**STEM_GC11ESP-IIc-d-65**	
			7. **(LAB)** Determine periodic properties of the main group elements	**STEM_GC11ESP-IIc-d-66**	
Chemical Bonding **Ionic Bonds** 1. The stability of noble gases	1. ionic bond formation in terms of atomic		1. relate the stability of noble gases to their electron configuration	**STEM_GC11CB-IId-g-67**	
			2. state the octet rule	**STEM_GC11CB-IId-g-68**	

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2. Forming ions 3. Ionic bonding 4. Ionic compounds 5. Formulas 6. Structure 7. Properties	properties 2. the properties of ionic compounds in relation to their structure		3. determine the charge of the ions formed by the representative elements and relate this to their ionization energy or electron affinity, valence electron configuration and position in the periodic table	**STEM_GC11CB-IId-g-69**	
			4. draw the Lewis structure of ions	**STEM_GC11CB-IId-g-70**	
			5. predict the formula of the ionic compound formed by a metal and non-metal among the representative elements	**STEM_GC11CB-IId-g-71**	
			6. Lewis structure of ionic compounds	**STEM_GC11CB-IId-g-72**	
			7. list the properties of ionic compounds and explain these properties in terms of their structure	**STEM_GC11CB-IId-g-73**	
			8. **(LAB)** Perform exercises on writing Lewis structures of ions/ionic compounds and molecules	**STEM_GC11CB-IId-g-74**	
Covalent Bonds 1. Formation of covalent bonds 2. Formulas of molecular compounds 3. Lewis structure of molecules 4. Molecules of elements 5. Molecules of compounds 6. Structure and properties of molecular compounds	1. covalent bond formation in terms of atomic properties 2. the properties of molecular covalent compounds in relation to their		9. describe covalent bonding in terms of electron sharing	**STEM_GC11CB-IId-g-75**	
			10. apply the octet rule in the formation of molecular covalent compounds	**STEM_GC11CB-IId-g-76**	
			11. write the formula of molecular compounds formed by the nonmetallic elements of the representative block	**STEM_GC11CB-IId-g-77**	
			12. draw Lewis structure of molecular covalent compounds	**STEM_GC11CB-IId-g-78**	

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7. Strength of covalent bonds 8. Electronegativity and bond polarity 9. Geometry of molecules 10. Polarity of compounds	structure		13. explain the properties of covalent molecular compounds in terms of their structure.	**STEM_GC11CB-IId-g-79**	
			14. determine the polarity of a bond based on the electronegativities of the atoms forming the bond	**STEM_GC11CB-IId-g-80**	
			15. describe the geometry of simple compounds	**STEM_GC11CB-IId-g-81**	
			16. determine the polarity of simple molecules	**STEM_GC11CB-IId-g-82**	
			17. **(LAB)** Determine and/or observe evidence of molecular polarity	**STEM_GC11CB-IId-g-83**	
Organic compounds 1. The carbon atom 2. Bonding patterns in hydrocarbons 3. Properties and reactivities of common functional groups 4. Polymers 5. Biomolecules	the properties of organic compounds and polymers in terms of their structure		1. describe the special nature of carbon	**STEM_GC11OC-IIg-j-84**	
			2. list general characteristics of organic compounds	**STEM_GC11OC-IIg-j-85**	
			3. describe the bonding in ethane, ethene(ethylene) and ethyne(acetylene) and explain their geometry in terms of hybridization and σ and ¶ carbon-carbon bonds	**STEM_GC11OC-IIg-j-86**	
			4. describe the different functional groups	**STEM_GC11OC-IIg-j-87**	
			5. cite uses of representative examples of compounds bearing the different functional groups	**STEM_GC11OC-IIg-j-88**	
			6. describe structural isomerism; give examples	**STEM_GC11OC-IIg-j-89**	
			7. describe some simple reactions of organic compounds: combustion of organic fuels, addition, condensation, and	**STEM_GC11OC-IIg-j-90**	

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			saponification of fats		
			8. describe the formation and structure of polymers	**STEM_GC11OC-IIg-j-91**	
			9. give examples of polymers	**STEM_GC11OC-IIg-j-92**	
			10. explain the properties of some polymers in terms of their structure	**STEM_GC11OC-IIg-j-93**	
			11. describe some biomolecules: proteins, nucleic acids, lipids, and carbohydrates	**STEM_GC11OC-IIg-j-94**	
			12. describe the structure of proteins, nucleic acids, lipids, and carbohydrates, and relate them to their function	**STEM_GC11OC-IIg-j-95**	
			13. **(LAB)** Perform exercises on the structure of organic compounds using of models	**STEM_GC11OC-IIg-j-96**	
			14. **(LAB)** Prepare selected organic compound and describe their properties	**STEM_GC11OC-IIg-j-97**	
			15. **(LAB)** Perform laboratory activities on enzyme action, protein denaturation, separation of components in coconut milk	**STEM_GC11OC-IIg-j-98**	
Third Quarter – General Chemistry 2					
Intermolecular Forces and Liquids and Solids 1. Kinetic molecular model of liquids and solids	1. the properties of liquids and solids to the nature of forces	design a simple investigation to determine the effect on boiling point or freezing point when a	1. use the kinetic molecular model to explain properties of liquids and solids	**STEM_GC11IMF-IIIa-c-99**	Laser Pointer, dual-function, with dry cells
			2. describe and differentiate the types of intermolecular forces	**STEM_GC11IMF-IIIa-c-100**	

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2. Intermolecular Forces 3. Dipole-dipole forces 4. Ion-dipole forces 5. Dispersion forces 6. Hydrogen bonds 7. Properties of liquids and IMF 8. Surface Tension 9. Viscosity 10. Vapour pressure, boiling point 11. Molar heat of vaporization 12. Structure and Properties of Water 13. Types and properties of solids 14. Crystalline and amorphous solids 15. Types of Crystals – ionic, covalent, molecular, metallic 16. Phase Changes - phase diagrams of water and carbon dioxide	between particles 2. phase changes in terms of the accompanying changes in energy and forces between particles	solid is dissolved in water	3. predict the intermolecular forces possible for a molecule	**STEM_GC11IMF-IIIa-c-101**	
			4. describe the following properties of liquids, and explain the effect of intermolecular forces on these properties: surface tension, viscosity, vapor pressure, boiling point, and molar heat of vaporization	**STEM_GC11IMF-IIIa-c-102**	
			5. explain the properties of water with its molecular structure and intermolecular forces	**STEM_GC11IMF-IIIa-c-103**	
			6. describe the difference in structure of crystalline and amorphous solids	**STEM_GC11IMF-IIIa-c-104**	
			7. describe the different types of crystals and their properties: ionic, covalent, molecular, and metallic.	**STEM_GC11IMF-IIIa-c-105**	
			8. describe the nature of the following phase changes in terms of energy change and the increase or decrease in molecular order: solid-liquid, liquid-vapor, and solid-vapor	**STEM_GC11IMF-IIIa-c-106**	
			9. interpret the phase diagram of water and carbon dioxide	**STEM_GC11IMF-IIIa-c-107**	
			10. **(LAB)** Measure and explain the difference in the viscosity of some liquids	**STEM_GC11IMF-IIIa-c-108**	

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			11. **(LAB)** Determine and explain the heating and cooling curve of a substance	**STEM_GC11IMF-IIIa-c-109**	
Physical Properties of Solutions 1. Types of Solutions 2. Energy of solution formation 3. Concentration Units and comparison of concentration units a. percent by mass, by volume b. mole fraction c. molality d. molarity e. percent by volume, percent by mass, ppm 4. Solution stoichiometry 5. Factors affecting Solubility 6. Colligative Properties of Nonelectrolyte and electrolyte solutions	properties of solutions, solubility, and the stoichiometry of reactions in solutions		1. describe the different types of solutions	**STEM_GC11PP-IIId-f-110**	Electrical Conductivity Apparatus
			2. use different ways of expressing concentration of solutions: percent by mass, mole fraction, molarity, molality, percent by volume, percent by mass, ppm	**STEM_GC11PP-IIId-f-111**	
			3. perform stoichiometric calculations for reactions in solution	**STEM_GC11PP-IIId-f-112**	
			4. explain the effect of temperature on the solubility of a solid and of a gas	**STEM_GC11PP-IIId-f-113**	
			5. explain the effect of pressure on the solubility of a gas	**STEM_GC11PP-IIId-f-114**	
			6. describe the effect of concentration on the colligative properties of solutions	**STEM_GC11PP-IIId-f-115**	Osmosis Apparatus
			7. differentiate the colligative properties of nonelectrolyte solutions and of electrolyte solutions	**STEM_GC11PP-IIId-f-116**	Ammonium Chloride, 100 grams / bottle
			8. Calculate boiling point elevation and freezing point depression from the concentration of a solute in a solution	**STEM_GC11PP-IIId-f-117**	
			9. calculate molar mass from colligative property data	**STEM_GC11PP-IIId-f-118**	

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			10. **(LAB)** Perform acid-base titration to determine concentration of solutions	**STEM_GC11PP-IIId-f-119**	1. Burette, 25ml. Capacity (acid) 2. Burette, 25ml. Capacity (base) 3. Erlenmeyer Flask, 250 ml., borosilicate 4. Graduated Pipette, 10ml. Cap. with rubber pipettor 5. Lye (NaOH), odorless white semi-transparent solids, 250 grams / bottle 6. Phenolphthalein Indicator, 100 grams/bottle 7. Volumetric Flask, 250ml.
			11. **(LAB)** Determine the solubility of a solid in a given amount of water at different temperatures	**STEM_GC11PP-IIId-f-120**	
			12. **(LAB)** Determine the molar mass of a solid from the change of melting point or boiling point of a solution	**STEM_GC11PP-IIId-f-121**	
Thermochemistry 1. Energy Changes in Chemical Reactions: exothermic and endothermic processes 2. First Law of Thermodynamics	energy changes in chemical reactions		1. explain the energy changes during chemical reactions	**STEM_GC11TC-IIIg-i-122**	
			2. distinguish between exothermic and endothermic processes	**STEM_GC11TC-IIIg-i-123**	1. Calorimeter 2. Lye (NaOH), odorless white semi-transparent solids, 250 grams / bottle

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3. Enthalpy of a Chemical Reaction - thermochemical equations 4. Calorimetry 5. Standard Enthalpy of Formation and Reaction Hess' Law			3. explain the first law of thermodynamics	**STEM_GC11TC-IIIg-i-124**	
			4. explain enthalpy of a reaction.	**STEM_GC11TC-IIIg-i-125**	
			5. Write the thermochemical equation for a chemical reaction	**STEM_GC11TC-IIIg-i-126**	
			6. Calculate the change in enthalpy of a given reaction using Hess Law	**STEM_GC11TC-IIIg-i-127**	
			7. **(LAB)** Do exercises on thermochemical calculations	**STEM_GC11TC-IIIg-i-128**	
			8. **(LAB)**Determine the heat of neutralization of an acid	**STEM_GC11TC-IIIg-i-129**	1. Calorimeter 2. Hydrochloric Acid, HCl, technical grade, 500 ml / bottle 3. Lye (NaOH), odorless white semi-transparent solids, 250 grams / bottle
Chemical Kinetics 1. The Rate of a Reaction 2. Factors that influence reaction rate 3. The Rate Law and its components 4. Collision theory 5. Catalysis	1. The rate of a reaction and the various factors that influence it 2. the collision theory		1. describe how various factors influence the rate of a reaction	**STEM_GC11CK-IIIi-j-130**	
			2. write the mathematical relationship between the rate of a reaction, rate constant, and concentration of the reactants	**STEM_GC11CK-IIIi-j-131**	
			3. differentiate zero, first-, and second-order reactions	**STEM_GC11CK-IIIi-j-132**	
			4. write the rate law for first-order reaction	**STEM_GC11CK-IIIi-j-133**	
			5. discuss the effect of reactant concentration on the half-time of a first-order reaction	**STEM_GC11CK-IIIi-j-134**	
			6. explain the effect of temperature on the rate of a	**STEM_GC11CK-IIIi-j-135**	1. Alcohol Burner, glass, 150ml. capacity

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			reaction		2. Bunsen Burner, gas-type 3. LPG tank with gas, 11 kg. capacity, regulator & hose assembly
			7. explain reactions qualitatively in terms of molecular collisions	**STEM_GC11CK-IIIi-j-136**	
			8. explain activation energy and how a catalyst affects the reaction rate	**STEM_GC11CK-IIIi-j-137**	Manganese Dioxide, 50 grams / bottle
			9. cite and differentiate the types of catalysts	**STEM_GC11CK-IIIi-j-138**	
			10. **(LAB)**Determine the effect of various factors on the rate of a reaction	**STEM_GC11CK-IIIi-j-139**	
Fourth Quarter – General Chemistry 2					
Chemical Thermodynamics 1. Spontaneous processes 2. Entropy 3. The Second Law of Thermodynamics 4. Gibbs Free Energy and Chemical Equilibrium	spontaneous change, entropy, and free energy	prepare a poster on a specific application of one of the following: a. Acid-base equilibrium b. Electrochemistry Include in the poster the concepts, principles, and chemical reactions involved, and diagrams of processes and other relevant materials	1. predict the spontaneity of a process based on entropy	**STEM_GC11CT-IVa-b-140**	
			2. determine whether entropy increases or decreases if the following are changed: temperature, phase, number of particles	**STEM_GC11CT-IVa-b-141**	
			3. explain the second law of thermodynamics and its significance	**STEM_GC11CT-IVa-b-142**	
			4. use Gibbs' free energy to determine the direction of a reaction	**STEM_GC11CT-IVa-b-143**	
Chemical Equilibrium 1. The equilibrium	Chemical equilibrium and		1. describe reversible reactions	**STEM_GC11CE-IVb-e-144**	

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condition 2. Writing the reaction quotient/equilibrium constant expression 3. Predicting the direction of a reaction 4. Significance of the equilibrium constant 5. Le Chatelier's Principle	Le Chatelier's Principle		2. explain chemical equilibrium in terms of the reaction rates of the forward and the reverse reaction	**STEM_GC11CE-IVb-e-145**	
			3. write expressions for the reaction quotient/equilibrium constants	**STEM_GC11CE-IVb-e-146**	
			4. explain the significance of the value of the equilibrium constant.	**STEM_GC11CE-IVb-e-147**	
			5. calculate equilibrium constant and the pressure or concentration of reactants or products in an equilibrium mixture	**STEM_GC11CE-IVb-e-148**	
			6. state the Le Chatelier's principle and apply it qualitatively to describe the effect of changes in pressure, concentration and temperature on a system at equilibrium	**STEM_GC11CE-IVb-e-149**	
			7. **(LAB)** Describe the behavior of reversible reactions	**STEM_GC11CE-IVb-e-150**	
			8. **(LAB)** Describe the behavior of a reaction mixture when the following takes place: a. change in concentration of reactants or products b. change in temperature	**STEM_GC11CE-IVb-e-151**	
			9. **(LAB)** Perform calculations involving equilibrium of gaseous reactions	**STEM_GC11CE-IVb-e-152**	
Acid-Base Equilibria and Salt Equilibria 1. Bronsted acids and bases	1. acid-base equilibrium and its applications		1. define Bronsted acids and bases	**STEM_GC11AB-IVf-g-153**	
			2. discuss the acid-base property of water	**STEM_GC11AB-IVf-g-154**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
2. The acid-base properties of water 3. pH- a measure of acidity 4. Strength of acids and bases 5. Weak acids/weak bases and ionization constants 6. Relationship between the ionization constants of acids and their conjugate bases 7. The Common Ion Effect 8. Buffer solutions 9. Solubility equilibria	to the pH of solutions and the use of buffer solutions 2. solubility equilibrium and its applications		3. define pH	**STEM_GC11AB-IVf-g-155**	
			4. calculate pH from the concentration of hydrogen ion or hydroxide ions in aqueous solutions	**STEM_GC11AB-IVf-g-156**	
			5. determine the relative strength of an acid or a base, from the value of the ionization constant of a weak acid or base	**STEM_GC11AB-IVf-g-157**	
			6. determine the pH of a solution of weak acid or weak base	**STEM_GC11AB-IVf-g-158**	1. pH Meter, range 0 to 14 pH 2. Universal pH Paper, ph 0-14, 100 strips/pack
			7. explain the Common Ion Effect	**STEM_GC11AB-IVf-g-159**	
			8. describe how a buffer solution maintains its pH	**STEM_GC11AB-IVf-g-160**	
			9. calculate the pH of a buffer solution using the Henderson-Hasselbalch equation	**STEM_GC11AB-IVf-g-161**	
			10. explain and apply the solubility product constant to predict the solubility of salts	**STEM_GC11AB-IVf-g-164**	
			11. describe the common ion effect on the solubility of a precipitate	**STEM_GC11AB-IVf-g-165**	
			12. explain the effect of pH on the solubility of a precipitate	**STEM_GC11AB-IVf-g-166**	
			13. **(LAB)** Determine the pH of solutions of a weak acid at different concentrations and in the presence of its salt	**STEM_GC11AB-IVf-g-167**	1. pH Meter, range 0 to 14 pH 2. Universal pH Paper, ph 0-14, 100 strips/pack 3. Zinc Nitrate, 100 grams / bottle

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			14. **(LAB)**Determine the behavior of the pH of buffered solutions upon the addition of a small amount of acid and base	**STEM_GC11AB-IVf-g-168**	
Electrochemistry 1. Redox reactions 2. Galvanic cells 3. Standard reduction potentials 4. Spontaneity of redox reactions 5. Batteries 6. Corrosion 7. Electrolysis	Redox reactions as applied to galvanic and electrolytic cells		1. define oxidation and reduction reactions	**STEM_GC11AB-IVf-g-169**	
			2. balance redox reactions using the change in oxidation number method	**STEM_GC11AB-IVf-g-170**	
			3. draw the structure of a galvanic cell and label the parts	**STEM_GC11AB-IVf-g-171**	
			4. identify the reaction occurring in the different parts of the cell	**STEM_GC11AB-IVf-g-172**	
			5. write the half-equations for the reactions occurring in the electrodes	**STEM_GC11AB-IVf-g-173**	
			6. write the balanced overall cell reaction	**STEM_GC11AB-IVf-g-174**	
			7. give different examples of galvanic cell	**STEM_GC11AB-IVf-g-175**	
			8. define reduction potential, oxidation potential, and cell potential	**STEM_GC11AB-IVf-g-176**	
			9. describe the standard hydrogen electrode	**STEM_GC11AB-IVf-g-177**	

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE	SCIENCE EQUIPMENT
			10. calculate the standard cell potential	**STEM_GC11AB-IVf-g-178**	
			11. relate the value of the cell potential to the feasibility of using the cell to generate an electric current	**STEM_GC11AB-IVf-g-179**	
			12. describe the electrochemistry involved in some common batteries: a. leclanche dry cell b. button batteries c. fuel cells d. lead storage battery	**STEM_GC11AB-IVf-g-180**	
			13. apply electrochemical principles to explain corrosion	**STEM_GC11AB-IVf-g-181**	
			14. explain the electrode reactions during electrolysis	**STEM_GC11AB-IVf-g-182**	Electrolysis Apparatus, Hoffman-type
			15. describe the reactions in some commercial electrolytic processes	**STEM_GC11AB-IVf-g-183**	
			16. **(LAB)** Determine the potential and predict the cell reaction of some assembled electrochemical cells	**STEM_GC11AB-IVf-g-184**	
			17. **(LAB)** Describe the reactions at the electrodes during the electrolysis of water; cite the evidence for your conclusion	**STEM_GC11AB-IVf-g-185**	Electrolysis Apparatus, Hoffman-type

Code Book Legend

Sample: STEM_GC11AB-IVf-g-183

LEGEND		SAMPLE	
First Entry	Learning Area and Strand/ Subject or Specialization	Science, Technology, Engineering and Mathematics General Chemistry	**STEM_GC11AB**
	Grade Level	Grade 11	
Uppercase Letter/s	Domain/Content/ Component/ Topic	Acid-Base Equilibria and Salt Equilibria	
			-
Roman Numeral **Zero if no specific quarter*	Quarter	Fourth Quarter	**IV**
Lowercase Letter/s **Put a hyphen (-) in between letters to indicate more than a specific week*	Week	Weeks six to seven	**f-g**
			-
Arabic Number	Competency	describe the reactions in some commercial electrolytic processes	**183**

DOMAIN/ COMPONENT	CODE
Matter and Its Properties	MP
Measurements	MT
Atoms, Molecules and Ions	AM
Stoichiometry	S
Percent Composition and Chemical Formulas	PC
Mass Relationships in Chemical Reactions	MR
Chemical reactions and chemical equations	CR
Gases	G
Dalton's Law of partial pressures	DL
Gas stoichiometry	GS
Kinetic molecular theory of gases	KMT
Electronic Structure of Atoms	ES
Electronic Structure and Periodicity	ESP
Chemical Bonding	CB
Organic compounds	OC
Intermolecular Forces and Liquids and Solids	MF
Physical Properties of Solutions	PP
Thermochemistry	TC
Chemical Kinetics	CK
Chemical Thermodynamics	CT
Chemical Equilibrium	CE
Acid-Base Equilibria and Salt Equilibria	AB

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