CH 122: General Chemistry
Course Syllabus
WDPHS 2021/2022

Bellin College

*DISCLAIMER: Due to COVID-19, we reserve the right to alter the course schedule (theory, lab, or clinical) and delivery method of coursework may change on short notice.

Placement	High School Junior or Senior
Credit Allocation	General Chemistry Lecture and Lab, 3.0 Theory Credits, 1.0 Lab Credit
Prerequisites	None
Course Format	24 weeks, Face-to-Face onsite course with online supplement.
Course Time & Location	View Course Schedule for details. (...or...) Meets in Room G134

Faculty

Joe Rukamp (**jrukamp@wdpsd.com**)

Communication Strategy

There are several ways you can contact me:

- **Office Hours.** I am available from 7:00-7:25am, during 5th period and after school by appointment.
- **Email**. This is the best way to contact me. I am available by email and will respond within 24.

There may be times when I need to communicate with you outside of the face to face course environment over the next several weeks. I expect that you will be responsive to my efforts to contact you.

General Communication Guidelines: Students are expected to be polite, respectful, and professional in all communication with course faculty and peers. Review the sections on anti-harassment, student behavior, and codes of conduct in the Bellin College Guide.

Communicating in Canvas Discussions: Online discussion forums provide opportunities to reflect and apply your learning in this course and exchange thoughts and ideas with others. Your posts should

be thoughtful yet succinct, limited to one or two ideas at a time to make it easier for your peers to follow your thought process. If your posts are too lengthy no one may read them and if they are too short you may not have provided enough substance for your peers to properly elaborate and build upon. You may use material from external sources with proper APA style citation.

Course Description

This course provides the opportunity for the learner to develop the knowledge and the skills process in the understanding of general chemistry. Topics covered are: metric system, problem-solving, periodic relationships, chemical reactions, equilibrium, properties of water, acids, bases, salts and gas laws as well as an introduction to organic chemistry. Students focus on skill development, communication and problem solving. Critical thinking skills are developed as students learn to collect and analyze data and work out the correct solutions.

Course Learning Outcomes

Upon completion of this course, the student will have:

1. Examined the scientific method and tools to solve problems. (Program Outcome 2)
2. Solved problems using measurements and conversions. (Program Outcome 2)
3. Explained the characteristics of matter and the changes it undergoes. (Program Outcome 4)
4. Written IUPAC and trivial names for select acids and bases, salts and organic compounds. (Program Outcome 4)
5. Analyzed the periodic relationships of the elements. (Program Outcome 4)
6. Solved mathematical problems relating to the mole, empirical and molecular formulas. (Program Outcome 2)
7. Explored chemical bonding. (Program Outcome 4)
8. Explained the behavior of matter during a chemical reaction. (Program Outcome 4)
9. Calculated the quantities of reactants and products from a balanced chemical question. (Program Outcome 2)
10. Calculated the concentrations of aqueous solutions. (Program Outcome 2)
11. Explained chemical equilibrium. (Program Outcome 4)
12. Compared the characteristics of acids, bases, salts and buffers. (Program Outcome 4)
13. Solved problems involving gas laws. (Program Outcome 2)
14. Defined oxidation and reduction reactions. (Program Outcome 4)
15. Summarized the characteristics of alpha, beta and gamma radiation. (Program Outcome 4)

Assessment of Outcomes

Unit Exams (2 per trimester)	30%
Final Exam	15%
Chapter Quizzes (12)	15%

Class Activity Worksheets and Homework Assignments	15%
Lab Assignments	25%
Total	**100%**

Required Books & Resources

Textbooks are required in order to support learning outcomes.

Note to students: See the Modules section for links to additional required articles, websites, and other resources.

Timberlake, K. C. (2018). General, Organic, and Biological Chemistry: Structures of life **plus Mastering Chemistry** with e Text-Access Card Package. (6th Edition). : Pearson

ISBN-13: 978-0134804675

Just the access code

Text plus Mastering

- **To enroll in Mastering, follow the directions in the modules.**
- **Scientific** Preferred Texas Instruments 30X or 36X. **No phone or graphical calculators allowed during Exams.** Please make sure to bring your own scientific calculator for all Quizzes, Tests, and Exams . You will not be provided with a calculator in the event you forget to bring your own calculator.

Objectives & Content Outline

CHAPTER 1: Chemistry In Our Lives	
Unit Objectives	**Content Outline**
Upon completion of the unit, the student will be prepared to: 1. Define Chemicals and Chemistry. Describe the Scientific Method and its use in everyday life. 2. Develop a study plan to learn Chemistry which includes Active Learning techniques. 3. Develop some Key Math Skills essential for Chemistry such as: 1- Identifying Place Values of any number.	**1. Classification of Substances** A. Definitions of Chemistry and Chemicals B. Descriptions of Common everyday chemicals **2. Scientific Method and the steps to using it in everyday life:** **Step1: Observation**: Observe nature, ask questions.

2- Using Positive and Negative numbers in calculations. 3- Calculating Percentages. 4- Writing numbers in scientific notation. 5- Using scientific numbers in calculations. 6- Solving Equations 7- Interpreting graphs	**Step 2: Hypothesis:** Propose an explanation for observed phenomena that can be tested by experiment. **Step 3: Experiment:** Plan repetitive experiments to test the proposed hypothesis **Step 4: Conclusion:** Analyze results obtained from the experiments and conclude whether they prove or disprove the stated hypothesis. If disproven, then revise the hypothesis and conduct more experiments, to support the new hypothesis.

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CHAPTER 2: Measurements	
Unit Objectives	**Content Outline**
Upon completion of the unit, the student will be prepared to: 1. Write the names and abbreviations for the different units used in measurements of length, volume and mass and write numbers both in the scientific and standard formats. 2. Apply the rules of significance and rules of rounding off to problems involving addition, subtraction, division, and multiplication and record the calculated answers adjusted to the correct number of significant figures. 3. Use the numerical values of prefixes to write equalities for conversions in both metric to metric units as well as metric to American units and also conversions not to specific to unit conversions. 4. Write conversion factors from equalities and problem solve using conversion factors to change from one unit into another. 5. Apply the definitions of density and specific gravity and convert them into conversion factors and problem solve with them to determine the mass or volume of a substance.	**1. Measurements** A. Basic Units of Measurement for Length, Mass, Volume, Temperature, and Time. B. Prefixes that change the size(s) of the metric unit in comparison to the basic unit. **2. Measured Numbers** A. Measured Numbers and the rules of significance requiring calculated answers to be rounded off to the correct number of significant figures. B. Calculations involving significant figures when performing addition, subtraction, multiplication, and division. **3. Prefixes** A. Prefixes placed in front of the unit indicate its value. In the metric system, the changes a prefix makes to a unit is always in factors of 10. List of all the prefixes used in the metric system for Length. Mass, Volume, and Time.

	4. Conversion Factors A. Definition and application of conversion factors to explain the relationship between two units or two items. B. Writing equalities and conversion factors for metric-metric and metric to American conversions and problem solving with these conversion factors.

CHAPTER 3: Energy and Matter

Unit Objectives	Content Outline
Upon completion of the unit, the student will be prepared to: 1. Identify the types of Energy and the units of Energy. Problem Solve using the unit(s) of Energy as a Conversion Factor(s). 2. Identify the three temperature units and convert the temperature of one unit to the corresponding temperature in another unit. 3. Write formula, unit, and conversion factor for specific heat and problem-solve for Heat Lost/Gained or Mass or Change in Temperature by applying the Specific Heat Conversion factor in these problems. 4. Determine the energy content of Food(s) in terms of carbohydrates, fats, and protein. 5. Classify mixtures and separate the components of a mixture. 6. Classify matter into solids, liquids, and gases and describe the characteristics of each of these three states of matter as well as distinguish between physical and chemical properties and changes. 7. Describe the changes of state such as melting, boiling, evaporation, condensation, freezing, and sublimation. Problem solve and determine the energy changes occurring during changes of state	**1. Energy** A. Distinguishing between kinetic and potential energy B. Definitions and formulas of common energy units such as calorie, joule, kilocalorie, and kilojoules and writing equalities and conversion factors for these units and problem solving using these conversion factors to change from one unit of energy into another. **2. Temperature** Deriving the relationship(s) between Celsius, Fahrenheit, and Kelvin temperature units and writing equalities and conversion factors from these relationships in order to convert one unit of temperature to the corresponding temperature in another unit. **3. Specific Heat** Definition and formula of specific heat and rearranging the formula to solve for one of the unknown variables using values of the known variables. **4. Energy and Nutrition**

	Description of a calorimeter and its use in determining caloric content of food using the known caloric energy values of fats, carbohydrates, and protein. **5. Classification of Matter** A. Classification of Matter into pure substances and mixtures and the further classification of pure substances into elements and compounds. B. Description of hetero and homogeneous mixtures and the techniques used to separate the individual components of a mixture. **6. States and Properties of Matter** Defining the characteristics and properties of the three states of matter namely, solids, liquids, and gases, and distinguishing between physical properties and changes and chemical properties and chemical changes. **7. Changes of State** A. Description of the energy changes involved in changes of state from solid to liquid and liquid to gas for water B. Problem solving using Heats of Vaporization and Fusion of water. C. Drawing Heating and Cooling Curves for Water

CHAPTER 4: Atoms and Elements	
Unit Objectives	**Content Outline**
Upon completion of the unit, the student will be prepared to: 1. Write the names and symbols of all the elements in the periodic table.	**1. Elements and Symbols** Names and the one or two-letter symbols for all the listed elements in the periodic table.

2. Identify the placement of metals, nonmetals, and metalloids in the periodic table. Distinguish between Groups and Periods. Identify the names and describe the key properties of some of the groups found in the periodic table.
3. Write the names, symbols, masses, and charges of subatomic particles such as protons, neutrons, and electrons and their locations in the atom.
4. Identify the atomic and mass numbers of elements from the periodic table and deduce the number of protons, neutrons, and electrons present in the neutral atoms of these elements from looking at their atomic and mass numbers.
5. Define what an isotope is and calculate the weighted average mass of an element given the percentage abundances and masses of all the naturally occurring isotopes of that element.
6. Identify the types of energy levels, sublevels, and orbitals found in an atom.
7. Write complete and abbreviated electron configurations of all atoms listed in the periodic table.
8. Describe and explain the periodic trends observed in the various groups and periods of the periodic table

2. Periodic Table

A. Placement of metals on the left side of the Periodic table and the characteristic properties of metals. Placement of non-metals on the extreme right side of the periodic table and their characteristic properties which distinguishes them from metals.

B. The heavy zigzag line separates the location of metals and non-metals in the periodic table and the metalloids located along the zigzag line.

C. Distinguishing between Groups and Periods and identifying specific groups such as alkali metals, alkaline earth metals, halogens, and noble gases and studying their characteristic properties.

3. The Atom

Key points of Dalton's atomic theory and the names, symbols, masses, and charges of the subatomic particles like protons, neutrons, and electrons.

4. Atomic Number and Mass Number

Definitions of Atomic and Mass Numbers and identifying Elements by their Atomic Numbers.

5. Isotopes and Atomic Mass

A. Defining an isotope and deducing the numbers of neutrons, protons, and electrons in an isotope given its mass and atomic number(s).

B. Calculating the weighted average mass of an element given the percentage abundances and mass numbers of all its naturally occurring isotopes.

6. Electron Energy Levels

	Description of Main Energy Levels or Principal Quantum Number, Sublevels, and orbitals found in an atom. Shapes of s and p orbitals. **7. Electron Configuration** Description of electron arrangements in terms of s, p, d, and f sublevels. Writing complete and abbreviated electron configurations for the listed elements of the periodic table. **8. Periodic Trends** A. Identifying periodic trends and their relationship to electron configurations B. Definition of the terms ionization energy and atomic radius and the discussion of the changes in these trends in the groups and periods of the periodic table.

CHAPTER 5: Nuclear Chemistry	
Unit Objectives	**Content Outline**
Upon completion of the unit, the student will be prepared to: 1. Describe alpha, beta, gamma radiations, and the types of protection needed to reduce the damages from exposure to these radiations. 2. Write equations for the different types of radioactive decay. 3. Define the units of measurement of radioactivity as well as the units used to assess the damages caused by radiation. 4. Calculate half-lives of isotopes and the amounts of radioisotope remaining after the passage of a certain amount of time given the half-life(s) of those radioisotopes. 5. Describe the uses of different radioisotopes in nuclear medicine. 6. Describe the differences between nuclear fission and nuclear fusion.	**1. Natural Radioactivity** A. Symbols, masses, and charges associated with alpha, beta, gamma, and positron particles. B. The PPE (Personal Protection Equipment) to be utilized to ensure adequate shielding from the harmful effects of alpha, beta, and gamma radiation. **2. Nuclear Reactions** A. Writing balanced equations for the different types of radioactive decay reactions. Balancing the mass numbers and atomic numbers of reactants and products in the reactions.

	B. Studying types of radioactive decay reactions involved in the creation of radioisotopes used in nuclear medicine **3. Radiation Measurement** A. Description of a Geiger counter and its use in measuring radioactivity. B. Definition of the units of radioactivity such as the Curie, milli-curie, and the Becquerel C. Definition of the units of assessing radiation damage on tissue such as rad, gray, rem, and Sievert **4. Half-life of a Radioisotope** A. Definition of the half-life of radioisotopes and using half-life to calculate the number of radioisotopes remaining after one or more half-lives. B. Studying the half-lives of a few medically important radioisotopes such as Tc-99m and I-131 **5. Medical Applications using Radioactivity** A. Description of the medical uses of radioisotopes. B. Studying the uses of specific radioisotopes in the detection, evaluation, and in some cases treatment of diseases and injuries. **6. Nuclear Fission and Fusion** Description of the processes occurring during nuclear fission and nuclear fusion with examples illustrating the differences between the two.

CHAPTER 6: Compounds and their Bonds	
Unit Objectives	**Content Outline**

Upon completion of the unit, the student will be prepared to: 1. State the Octet Rule and its importance in bonding as well as write the symbols of ions formed by the representative elements of the Periodic table. 2. Use the principle of Charge Balance to write correct formulas for ionic compounds given their names. 3. Write the correct name for an ionic compound given its formula. 4. Write names and formulas for the compounds formed with polyatomic ions. 5. Describe the nature of covalent bonding and the different types of covalent bonding and illustrate the various types of covalent bonding with examples. 6. Name and write the formulas of covalent compounds. 7. Define Electronegativity and distinguish between polar covalent bonds and nonpolar covalent bonds. 8. Describe the key points of the VSEPR theory and use the rules of this theory and that of bond polarity to determine the shape and	**1. Octet Rule and Ions** A. Definition of Octet Rule and its importance in bonding and ion formation B. Writing symbols for the ions of representative elements found in Groups 1A -7A C. Naming metal and nonmetal ions D. Writing formulas and charges of metal and nonmetal ions **2. Ionic Compounds** A. Writing Formulas of neutral ionic compounds where the total charge on the compound is zero B. Writing formulas of ionic compounds and observing the rule of charge balance such that the overall charge on the compound is zero. **3. Naming and Writing Ionic Formulas** A. Studying the Nomenclature (naming) of ionic compounds which involves naming the positive ion first followed by the name of the negative ion. B. Nomenclature of the ionic compounds formed by transition metals **4. Polyatomic Ions** A. Studying the different types of polyatomic ions and the nomenclature of ionic compounds formed from polyatomic ions. B. Discussion of the degree of bond strength(s) and attractive forces observed in ionic bonds, dipole-dipole interactions, and dispersion forces.

CHAPTER 7: Chemical Reactions and Quantities

Unit Objectives	Content Outline
Upon completion of the unit, the student will be prepared to: 1. Write balanced equations for a chemical reaction using the correct formulas for the reactants and products of the reaction. 2. Describe the different types of reactions and illustrate each type with an example. 3. Define the terms oxidation and reduction. Identify the oxidized species and the reduced species in an oxidation-reduction (redox) reaction. 4. Define the term "Mole" and be able to problem-solve with moles. 5. Define Molar Mass and use it to convert moles to grams and vice versa. 6. Draw a Mole Map and utilize it to problem solve in calculations involving the conversion moles of one substance into moles of another substance, given the balanced equation for a reaction. 7. Draw and utilize an Extended Mole Map to convert mass in grams of one substance into the mass in grams of another. 8. Determine the limiting reactant in a reaction and the percentage yield as well as the theoretical yield of product formed in the reaction. 9. Differentiating between exothermic and endothermic reactions.	**1. Chemical Reactions** A. Learning about the chemical Equation, which is a "roadmap", of information pertaining to the chemical reaction it is describing. B. Balancing Chemical Equations applying the Principle of Law of Conservation of Mass. **2. Types of Reactions** Classifying Reactions according to types, such as Combustion, Decomposition, Single Replacement, or Double Replacement. **3. Oxidation-Reduction Reactions** Definition of the terms oxidation and reduction. Applying these terms to an oxidation-reduction reaction and determining which of the reactants is the oxidized species and which is the reduced species. **4. The Mole** Problem Solving using the Avogadro Number also called "The Mole". Using mole(s) to determine the number of atoms (in an element) or the number of molecules/formula units (in a compound). **5. Molar Mass** Learning to draw a mole map to facilitate the ease of converting moles of a substance to grams of a substance and vice versa. **6. Mole Relationships in Chemical Equations** Using the Mole-Mole factor relationship between two substances in a balanced chemical equation to convert

	moles of one of the substances (in the relationship) to moles of the other using Coefficients obtained from the equation. **7. Mass Calculations for Reactions** Using the Mole-Mole factor relationship between two substances in a balanced chemical equation to convert grams of one of the substances (in the relationship) to grams of the other using coefficients obtained from the equation. **8. Percent Yield and Limiting Reactants** Determining Limiting Reactant in a chemical reaction and the theoretical and percentage yields of product formed in the reaction. **9. Energy Changes in Chemical Reactions** Determining the heat (s) of reaction (ΔH) for endothermic and exothermic reactions.

CHAPTER 8: Gases	
Unit Objectives	**Content Outline**
Upon completion of the unit, the student will be prepared to: 1. Enumerate the key points of the Kinetic Molecular Theory (KMT) of gases and their application to the physical properties of gases. 2. List the names and values of the different units of measurement of gas pressure. 3. Describe Boyle's law and its application. Problem-solve using this Pressure-Volume relationship for gases. 4. Describe Charles's law and its application. Problem-solve using this Temperature-Volume relationship for gases. 5. Describe Gay-Lussac's law and its application. Problem-solve using this Pressure- Temperature relationship for gases.	**1. Properties of Gases** Description of KMT (Kinetic Molecular Theory) of gases. The key points of KMT in describing the physical properties of a gas such as volume, pressure, temperature, and moles or amount of gas. **2. Gas Pressure** Definitions of the different units of gas pressure such as torr, mmHg, and atm. Learning to problem-solve and interconvert between these units.

6. Describe Avogadro's law and its application. Problem-solves using this Volume-mole relationship for gases.
7. Define the Ideal Gas Law and problem solve with it.
8. Describe Dalton's Law of Partial Pressure and problem-solve with it.

3. Boyle's Law: Pressure-Volume Relationship

Description of Boyle's Law and its application. Problem-solving with Boyle's Law relationship.

4. Charles Law: Temperature-Volume Relationship

Description of Charles Law and its application. Problem-solving with the Charles Law relationship.

5. Gay-Lussac's Law: Temperature-Pressure Relationship

Description of Gay-Lussac's Law and its application. Problem-solving with Gay-Lussac's Law relationship.

6. Combined Gas Law

Problem-Solving with the Combined Gas Law which combines Boyle's, Charles, and Gay- Lussac's Laws' and takes the form :

P1V1 = P2V2 T1 T2

In the above expression if the value of one of the variables is unknown it can be calculated provided the values of the other 5 variables are known.

7. Avogadro's Law: Volume-Mole Relationship

Description of Avogadro's Law and its application. Problem-solving with the Avogadro's Law.

8. Ideal Gas Law

Problem-solving with the Ideal Gas Law which takes the form PV = nRT. In this expression, if one variable is unknown its value can be calculated if the values of the other three variables are known.

9. Dalton's Law of Partial Pressures

	Description of Dalton's Law of Partial Pressures which can be used to calculate the Total Pressure exerted by a mixture of gases. Problem-solving with this relationship.

CHAPTER 9: Solutions

Unit Objectives	Content Outline
Upon completion of the unit, the student will be prepared to: 1. Define the terms and distinguish between Solution, Solute (polar/ nonpolar), Solvent (polar/nonpolar). 2. Describe the different types of electrolytes and define the terms Equivalent and Milli- equivalent. 3. Define Solubility and distinguish between saturated and unsaturated solutions. Describe the rules of solubility and its application in determining net ionic equations. 4. Define the percent concentration of solutions in terms of mass/ mass, mass/volume, and volume/volume percentages. Problem-solve with these relationships to solve for the amount of solute / or the amount of solvent in a solution. 5. Define Molarity and Dilution and list their applications. Problem-solve with these relationships. 6. Describe the different types of solutions and the physical properties of solutions. Describe osmosis and osmotic pressure and distinguish between isotonic, hypotonic, and hypertonic solutions.	**1. Solutions** A. Description and formula of a solution B. Definition of solute and solvent C. Descriptions of polar and nonpolar solutes and solvents D. Explanation of hydrogen bonding and polarity **2. Electrolytes and Nonelectrolytes** A. Description and examples of strong, weak, and non-electrolytes. B. Definitions and formulas of Equivalent and milli-equivalent. C. Problem solving with equivalents and milli-equivalents. **3. Solubility** A. Definition of Solubility B. Descriptions of saturated and unsaturated solutions. C. Rules of Solubility. D. Molecular, Complete ionic, and net ionic equations. Spectator ions. **4. Percent Concentrations** A. Definitions and formulas of : volume/volume (v/v) mass/ volume (m/v) mass/ mass (m/m) Percent Solutions.

	B. Using the v/v, m/v, m/m formulas as conversion factors to problem solve and determine the amount(s) of solute or solvent in a solution. **5. Molarity and Dilution** A. Definition and formula for Molarity and Dilution. B. Using the units of molarity (moles/L) as a conversion factor to calculate for moles of solute or volume of solution. C. Problem solving with dilution. D. Determining the quantities/ concentrations of reactant or products of a reaction using known values of mass, solution volume, and molarity of a substance (reactant) using a balanced chemical equation describing the reaction. **6. Physical Properties of Solution** A. Classification of solutions as true solutions, colloids, and suspensions. B. Definitions of osmosis and osmotic pressure. Problem-solving with osmotic pressure. C. Description of dialysis with examples. D. Description of the effect of isotonic, hypotonic, and hypertonic solutions on a red blood cell.

Chapter 10: Chemical Equilibrium	
Unit Objectives	**Content Outline**
1. Define the rates of reactions and describe the effect of temperature, concentration, and catalysts on the reaction rate. 2. Define Chemical Equilibrium and distinguish between reversible and irreversible reactions.	1. Rates of Reaction Determine the factors that affect the rates of reaction. 2. Chemical Equilibrium

3. Define Equilibrium Constant and write the Equilibrium Constant expressions for heterogeneous and homogeneous equilibrium reactions. 4. Predict the extent of an equilibrium reaction using the value of its equilibrium constant. 5. Describe Le Chatelier's Principle and its application to equilibrium reactions.	Explain what equilibrium means and a reversible reaction. 3. Equilibrium Constants Write an equilibrium expression given a chemical reaction and calculate the Equilibrium constant. 4. Using Equilibrium Constants in predicting the extent of a reaction Calculating concentration at equilibrium. 5. Le Chatelier's Principle and its effect on Equilibrium • Effect of changing volume • Adding a catalyst • Changing concentration • Changing temperature

CHAPTER 11: Acids and Bases

Unit Objectives	Content Outline
Upon completion of the unit, the student will be prepared to: 1. Distinguishing between the Arrhenius and Brønsted-Lowry acids and bases and identifying conjugate acid-base pairs. 2. Write equations for the dissociation reactions of strong acids and weak acids and the equilibrium expression for the dissociation reaction of a weak acid. 3. Write the expression for Kw or Ion-Product Constant for the self-ionization reaction of water. Using Kw value to calculate the hydronium ion ($[H_3O+]$) and the hydroxide ion ($[OH•]$) concentrations in acidic and basic solutions. 4. Define pH, writing the formula for pH, and calculating the pH of various solutions. 5. Write balanced equations for the reactions of acids with : a. Metals b. Carbonates and bicarbonates c. Bases	**1. Acids and Bases** A. Definition of Arrhenius and Brønsted-Lowry acids and bases and illustration with examples. B. Definition of conjugate acid-base pairs with examples. C. Identification of conjugate acid-base pairs. **2. Strengths of Acids and Bases** A. Distinguishing between strong and weak acids. B. Writing Equilibrium Expression for a weak acid dissociation. **3. Ionization of Water** A. Deriving the expression for Kw or Ion- Product Constant of water and its application in determining the hydronium ion ($[H_3O^+]$) and the

6. Predict whether an aqueous solution of a salt will form or not
7. Describe the role of buffers in maintaining the pH of a solution and the importance of buffers in maintaining the pH of the blood.

hydroxide ion ($[OH^-]$) concentrations in various solutions.

B. Distinguishing between acidic, basic, and neutral solutions based on their hydronium ion ($[H_3O^+]$) and hydroxide ion ($[OH^-]$) concentrations.

4. The pH scale

A. Definition of pH and description of the pH scale

B. pH calculations involving hydronium ion ($[H_3O^+]$) and hydroxide ion ($[OH^-]$) concentrations.

5. Reactions of Acids and Bases

A. Description with examples of the acid reaction metals and the resultant production of hydrogen gas.

B. Description with examples of the acid reaction carbonates and bicarbonates and the resultant production of carbon dioxide gas.

C. Description with examples of the acid reaction with bases called the Acid-Base Neutralization Reaction.

D. Description of a Titration Reaction which is also an Acid-Base Neutralization and determination of acid concentration given the volume and molarity of the base used in the reaction.

6. Acid-Base properties of salt solutions

A. ***Aqueous solutions*** of ***salts of weak acids*** form ***Basic Solutions***. Illustration of this concept with examples.

B. ***Aqueous solutions*** of ***salts of weak bases*** form ***Acidic Solutions***. Illustration of this concept with examples.

C. Aqueous solutions of salts of strong acids/ or strong bases form neutral solutions. Illustration of this concept with examples.

7. Buffers

A. Illustration with examples of how a buffered solution can resist changes in

	pH when small amounts of acid or base are added. B. Definition of a buffer and its uses. C. Description of how blood buffers keep the pH of blood constant which is critical to maintaining life.

CHAPTER 12: Introduction To Organic Chemistry - Alkanes	
Unit Objectives	**Content Outline**
Upon completion of the unit, the student will be prepared to: 1. Distinguish between organic and inorganic compounds. 2. Classify hydrocarbons and name the alkane compounds. 3. Write the names and structures of alkanes with substituents. 4. List the physical and chemical properties characteristic of alkanes.	**1. Organic Compounds** A. Identification of the characteristic properties of organic and inorganic compounds. B. Descriptions of simple organic compounds like methane. **2. Alkanes** A. A description of the IUPAC (International Union Of Pure and Applied Chemistry) system of naming organic compounds especially hydrocarbons and alkanes in particular. B. Practicing the writing of molecular formulas, complete and condensed structural formulas of alkanes. **3. Alkanes with Substituents** A. Practicing writing IUPAC names of substituted alkanes. B. Writing structural formulas both condensed and complete for substituted alkanes given their names. **4. Properties of Alkanes** Description of physical and chemical properties of alkanes.

Accommodations Request

Bellin College has a continuing commitment to providing reasonable accommodations for students with documented disabilities. Students with disabilities who may need some accommodation in order to fully participate in this class are urged to contact the Advisor and Accommodations Coordinator in Student Services One Stop, as soon as possible, to explore what arrangements need to be made to assure access.

Grading Policy

The following grading system is used to determine course achievement:

	Letter Grade	Grade Points Per Credit	Numeric Grade Equivalent
	A	4 points	93-100
	AB	3.5 points	88-92
	B	3 points	83-87
	BC	2.5 points	78-82
BELLIN COLLEGE MINIMUM PROGRESSION REQUIREMENT	C	2.0 points	70-77
	D	1 point	60-69
	F	0 point	below 60

Each course is graded in its entirety. A student must be successful in all course requirements to receive a passing grade. The course outcomes are represented in all course components.

Assessment of Student Academic Achievement Plan

Any testing and remediation required as part of the Assessment Plan must be completed prior to progression into subsequent courses.

Exam Proctoring

Bellin College students are responsible to pursue their studies with integrity and honesty. Exams in Canvas are proctored using Honorlock, an online proctoring service that promotes academic integrity. Students taking exams in Canvas are required to use this system as instructed by faculty. Honorlock is available 24/7 and all that is needed is a computer, a working webcam, and a stable Internet connection. Please see the Technical Requirements & Support link for more details.

Academic Policies

Please refer to the **Bellin College Guide - Handbook & Catalog** for the following policies:

- Attendance Policy (class, lab, clinical)
- Late Exam Policy
- Late Graded Assignment Policy
- Academic Misconduct Policy
- Information Technology – Acceptable Use Policy

Copyright Notice

Student Use of Electronic Devices during Courses

Electronic devices within the classroom, lab, and clinical courses may be utilized by students for appropriate learning purposes only. Cell phone ringtones shall be put on "vibrate/silent" during all course times and utilized for emergency purposes only. Repeated violations and/or course disruptions due to inappropriate use of electronic devices will be referred to the appropriate Program Director for disciplinary measures.

Bellin College Values

Excellence - *being the best*

Integrity - *honest and ethical behavior*

Community - *collaboration and inclusion*

Caring - *empowering relationships based on empathy and respect*

Supplementary Documents

- View the **Course Schedule** for the weekly topic, preparation, and assignment details

CH 122: Bellin Chemistry (Fall 2021-Winter 2022)

Week	Outline/Topic	Preparation & Assignments
Week 1	Course orientation Intro to Chem 122	Syllabus & Schedule Lab Safety and Check In
Week 2	Chapter 1: Chemistry in our Lives	Chapter 1 Study Guide Chapter 1 Homework Chapter 1 Quiz Lab #1
Week 3	Chapter 2: Chemistry & Measurements	Chapter 2 Study Guide Chapter 2 Homework Chapter 2 Quiz Lab #2
Week 4	Chapter 3: Matter & Energy	Chapter 3 Study Guide Chapter 3 Activities Lab #3
Week 5	Chapter 3: Matter & Energy Continued	Chapter 3 Homework Chapter 3 Quiz Lab #4
Week 6	Chapter 4: Atomic Structure	Chapter 4 Study Guide Chapter 4 Activities

		Lab #5
Week 7	Chapter 4: Atomic Structure Continued Review Ch 1-4 **Unit 1 Exam**	Chapter 4 Homework Chapter 4 Quiz **Unit 1 Exam (Chapters 1-4)**
Week 8	Chapter 5: Nuclear Chemistry	Chapter 5 Study Guide Chapter 5 Activities Lab #6
Week 9	Chapter 5: Nuclear Chemistry Continued	Chapter 5 Homework Chapter 5 Quiz Lab #7
Week 10	Chapter 6: Ionic & Molecular Compounds	Chapter 6 Study Guide Chapter 6 Activities Lab #8
Week 11	Chapter 6: Ionic & Molecular Compounds Continued	Chapter 6 Homework Chapter 6 Quiz Lab #9
Week 12	Chapter 7: Chemical Reactions	Chapter 7 Study Guide Chapter 7 Activities Lab #10

Week 13	Chapter 7: Chemical Reactions Continued	Chapter 7 Homework Chapter 7 Quiz Lab #11
Week 14	Chapter 8: Gases	Chapter 8 Study Guide Chapter 8 Activities Lab #12
Week 15	Chapter 8: Gases Continued Review Chapters 5-8 **Unit 2 Exam**	Chapter 8 Homework Chapter 8 Quiz **Unit 2 Exam (Chapters 5-8)**
Week 16	Chapter 9: Solutions	Chapter 9 Study Guide Chapter Activities Lab #13
Week 17	Chapter 9: Solutions Continued	Chapter 9 Homework Chapter 9 Quiz Lab #14
Week 18	Chapter 10: Equilibrium	Chapter 10 Study Guide Chapter 10 Activities

		Lab #15
Week 19	Chapter 10: Equilibrium Continued	Chapter 10 Homework Chapter 10 Quiz Lab #16
Week 20	Chapter 11: Acids and Bases	Chapter 11 Study Guide Chapter 11 Activities Lab #17
Week 21	Chapter 11: Acids and Bases Continued	Chapter 11 Homework Chapter 11 Quiz Lab #18
Week 22	Chapter 12: Alkanes and Introduction to Organic Chemistry	Chapter 12 Study Guide Chapter 12 Activities Lab #19
Week 23	Chapter 12: Alkanes and Introduction to Organic Chemistry Continued	Chapter 12 Homework Chapter 12 Quiz **Unit 3 Exam (Chapters 9-12)**

	Review Chapters 9-12 **Unit 3 Exam**	
Week 24	Review Chapter 1-12 **Final Exam**	**Final Exam – *Comprehensive* on Units 1-3**