Course Title:	**Chemistry II :** **ANALYTICAL & ORGANIC CHEMISTRY**
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Cycle/Division:	High School
Grade Level:	Grade 12
Credit Unit:	1
Duration:	2 semesters / 5 periods per week

Department's Vision:	Create Innovators who can link to life, with scientific understanding and learning.
Department's Mission:	Provide students with the proper knowledge, skills and scientific principles through hands on activities, research and experimentations, and thus creating young innovators who are ready for real life challenges and problem solving.

COURSE DESCRIPTION:

This course introduces the chemistry important to biological processes, and includes organic molecules, chemical reactions, acids/bases, titration, equilibrium, stoichiometry, ions behavior and colligative properties. Emphasis is on the aspects of general, organic, and biological chemistry that apply to biological systems and processes. The laboratory work is based on research and open lab design and application with a term lab theoretical and practical assessment.

General Academic Goals:

Understand the interaction of matter through the analysis of acids/bases in titration and how ions interact in ionic reactions.

-Apply stoichiometric calculations to the 6 different kinds of chemical reactions.

-Relate Chemistry to biology through the study of organic compounds

General Skills:

Evaluation skills: making judgment about knowledge by introducing new text to solve and tackle problems using the related knowledge taught.

Comprehension: given scientific text or diagrams to analyze and answer questions about, summarize, compare, relate, or experiment...
Communication and social skills: Making movies, ppt., projects, interviews, and presenting the work either individually or with a peer or as a group.
Investigative skills: lab work, research, journals, experimentation...
Mathematical skills: related to investigations in the lab and application in projects.
Technological skills used in science and computer labs.
Knowledge skills: list, define, show, demonstrate, invent, relate etc… using the taught concepts.

GENERAL COURSE LEARNING OBJECTIVES:

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Describe the dissociation of ionic compounds and the ionization of some molecular compounds when they dissolve in water, distinguish between strong and weak electrolytes, show how precipitation reaction reactions occur, and describe methods of writing ionic equations for precipitation reactions.
Describe acids and bases, define Arrhenius acids and bases, introduce acid base nomenclature, and characterize strong and weak and acids and bases.
Describe two more acid-base theories: the Bronsted Lowry and Lewis theories.
Explain acid-base reactions in aqueous solutions.
Explain the ionization of water and the equilibrium concentrations of H3O+ and OH- in water and in aqueous solutions of acids and bases and present the concept of pH mathematically.
Explain how acid-base indicators work, how indicators and pH meters are used to determine the pH of a solution, and how titrations are used to measure the concentration or mass of a substance in a sample.
Define heat, temperature, enthalpy change and enthalpies of reaction, formation and combustion.
Explain how to use enthalpy, entropy, and free energy to predict whether a reaction will occur.
Use collision theory and activation energy to describe the mechanisms by which chemical reactions take place.
Review the factors that influence the rate of a chemical reaction, show how to describe the rate based on experimental data, and relate the reaction rate to the mechanism of the reaction.
Define reversible reactions, the state of equilibrium, and K, the equilibrium constant.
Describe how equilibria will shift in response to changes in concentration, pressure and temperature and discuss the common-ion effect.
Describe the equilibria of acids, bases and salts. Explain the acid ionization constant, Ka and discuss buffering and hydrolysis.
Discuss solubility equilibria and explain calculations involving the solubility product constant, Ksp, and precipitate formation.
Define oxidation and reduction reactions and provide rules for determining oxidation numbers.
Present guidelines for balancing redox equations by using the half-reaction method.
Describe the roles of the oxidizing agent and the reducing agent in a redox reaction.
Describe carbon bonding as the key to diversity of organic compounds, and introduce structural formulas and isomers
Explain the significance of a chemical formula.

Determine the formula of an ionic compound formed between two given ions.
Name an ionic compound given its formula.
Using prefixes, name a binary molecular compound from its formula.
Write the formula of a binary molecular compound given its name.
Calculate the formula mass or molar mass of any given compound.
Use molar mass to convert between mass in grams and amount in moles of a chemical compound.
Calculate the number of molecules, formula units, or ions in a given molar amount of a chemical compound.
Calculate the percentage composition of a given chemical compound.
List three observations that suggest a chemical reaction has taken place.
List three requirements for a correctly written chemical equation.
Write a word equation and a formula equation for a given chemical reaction.
Balance a formula equation by inspection.
Define and give general equations for synthesis, decomposition, single replacement, and double replacement.
Classify a reaction as a synthesis, decomposition, single replacement, double replacement, or combustion reaction.
List 3 kinds of synthesis, and 6 kinds of decomposition reactions
List 4 kinds of single replacement reactions and 3 kinds of double displacement reactions.
Predict the products of a simple reaction given the reactants.
Explain the significance of an activity series.
Use an activity series to predict whether a given reaction will occur and what the products will be.
Define stoichiometry.
Describe the importance of the mole ratio in stoichiometric calculations.
Write a mole ratio relating 2 substances in a chemical equation.
Calculate the amount in moles of a reactant or product from the amount in moles of a different reactant or product.
Describe a method for determining which of two reactants a limiting reactant is.
Calculate the amount in moles or mass in grams of a product, given the amounts in moles or masses in grams of two reactants, one of which is in excess.

STANDARDS/BENCHMARKS:

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, onserved during a chemical reaction.
HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction

occurs.
HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-6 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

RESOURCES:

HOLT Chemistry book and online resources
One Stop Planner, Linked Lesson presentations, Extended Visual Labs
You Tube movies
E-games and links
Teacher's Extended Handouts
Lab Handouts

COURSE OUTLINE:

***Chapter 7:* Chemical formulas and chemical compounds**
Section 1: Chemical names and formulas
Section 3: Using chemical formulas

***Chapter 8:* Chemical Equations and reactions**
Section 1: Describing chemical reactions
Section 2: Types of chemical reactions
Section 3: Activity series of the elements

Chapter 9: Stoichiometry

Section 1: Introduction to stoichiometry
Section 2: Ideal stoichiometric calculations
Section 3: Limiting reactants and percentage yield

Chapter 13: Ions in aqueous solutions and colligative properties

Section 1: Compounds in aqueous solutions

Chapter 14: Acids and Bases

Section 1: Properties of acids and bases
Section 2: Acid-Base Theories
Section 3: Acids-Base reactions

Chapter 15: Acid-Base Titration and pH

Section 1: Aqueous solutions and the concept of pH
Section 2: Determining pH and Titrations

Chapter 18: Chemical Equilibrium

Section 1: The nature of chemical equilibrium
Section 2: Shifting equilibrium
Section 3: Equilibria of acids and bases
Section 4: Solubility equilibrium

Chapter 22: Organic chemistry

Section 1: Organic compounds
Section 2: Hydrocarbons
Section 3: Functional groups
Section 4: Organic reactions

Chapter 23: Biological chemistry

Section 1: carbohydrates and lipids
Section 2: Amino acids and proteins

GRADING:

1. Quizzes /tests are given every other week as assigned by school. **Our tests and assessments** consist of multiple-choice, short answer, direct application problems, critical thinking situations, refer to figures, texts, graphs and/or open response items. They are aligned with Michigan benchmarks. A student failing any of his quizzes would have to sit for a **support class and retest** to achieve his 60% which is our passing mark. **A progress report is sent to the parent eventually after sitting for the make up exam.** 40 % is given to students that do not have a medical excuse for missing such an assessment.

2.Skill Based Assignments are done in class where a student has his resources all opened in front of him to answer a set of questions under verbal, nonverbal, quantitative, and spatial domains.

3. Research Sessions are done where students can debate as groups and check the internet for resources and answers to support their ideas. This kind of assessment is under **Research /Project/ Lab Sessions /Journals**. They are evaluated to info, creativity, presentation, discussion and relation to the subject.

4.Daily assessments and drop quizzes take place to check the understanding of students.
5. Laboratory work is checked for research, completeness, accuracy, understanding the experiment, group and individual reports and attendance with the lab coats. Every semester has one term practical assessment.

7. Projects are integrated across and assigned for every term. They are evaluated to accuracy, creativity, info and relation to the subject.

Grade Distribution:

SCIENCE DEPARTMENT GRADE DISTRIBUTION	
HIGH SCHOOL	
End of semester assessment	30%
Quizzes	30%
Skill based Assessment	5%
Project	10%
Research/Journal	5%
Labs	10%
MAP	5%
Drop Quizzes	5%

Cross-Curricular Project(s):
- Once per semester across disciplines.