Dominican International School

Basic Chemistry
COURSE SYLLABUS

GRADE LEVEL: **G10** **SCHOOL YEAR**: 2023-2024

TEACHER: Dr. Ram Gopal **EMAIL**: rgopal@dishs.tp.edu.tw

COURSE DESCRIPTION:

It is my privilege to introduce you to Chemistry. The materials and activities for this course create an approachable, interesting, yet challenging, learning environment. I provide a variety of ways for you to acquire and demonstrate your understanding of chemistry. It is your responsibility to do the learning. Sometimes this is not 'fun'; in fact, sometimes it is hard work. However, it is rewarding and important for your future. This course will provide you with the opportunity to develop a strong background in chemistry. The core material covers the competencies and grade-level expectations described in the Vermont Frameworks and Standards for high school students. We will be undertaking the study of chemistry! We will be learning a great deal, and I plan to have a great year! You will be expected to work hard. It is imperative that you never get behind! We will do as many labs as possible. Chemistry is the study of the composition, properties, and transformations of matter. The basis for all experiments performed in science is the scientific method. Chemistry knowledge is acquired through experimentation, and experimentation requires both measurement and data analysis.

COURSE OBJECTIVES:

HS. Basic Chemistry

The student must be following NGSS standards for their curriculum as mention in following paragraphs:

PS1A: Structure and Properties of Matter. Stoichiometry involves calculations of the quantities of reactants and products in a chemical reaction. The NGSS focus on the deep understanding of core ideas, and stoichiometry can be integrated in instruction when building towards performance expectations that address chemical reactions and conservation of atoms during chemical reactions.

PS1B: Chemical Reactions. Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in total binding energy (i.e., the sum of all bond energies in the set of molecules) that are matched by changes in kinetic energy. In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. Chemical processes and properties of materials underlie many important biological and geophysical phenomena.

PS1C: Oxidation / Reduction. The NGSS do not include specific names of chemical reactions and instead focus on conceptual understanding of how chemical reactions occur. This ensures that students have a conceptual understanding that they can apply to any type of chemical reaction. Classes of chemical reactions

such as oxidation and reduction, acid and base, or decomposition and synthesis can be used in instruction depending on the context, but instruction should ensure that students have an understanding of the underlying concepts.

PS3A: Definitions of Energy. The NGSS describe those chemical reactions can either store energy (endothermic) or release energy (exothermic). Exothermic and endothermic reactions are addressed in the performance expectations that look at the change in energy in components of a system while considering the inputs and outputs of energy of the system.

Many vocabulary words do not explicitly appear in the standards, because the NGSS focus on a deep understanding of the concept behind a vocabulary word. Vocabulary can be introduced and applied, as needed, for instructional purposes.

The student should be able to:

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]

HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.] [Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]

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. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]

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. [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]

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. [Clarification Statement: Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples

of designs could include different ways to increase product formation including adding reactants or removing products.] [Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.]

HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]

ASSESSMENT:

There will be both formal and informal assessments. For content assessment, each unit will end with a test. For each student's grade, the assessment will be a follow, in accordance with the school's assessment policy:

1/3 Quarter exam

1/3 Homework, Seatwork, Projects:

1 Group project per semester including a report and presentation. Will be peer assessed as well as teacher assessed.

1 Formally Assessed group laboratory investigation per quarter

1 Individual homework per week (worksheet, concept map, essay, questions form textbook, online quiz etc.)

Notebooks will be graded once per unit to make sure all write ups and classroom activities are up to date

1/3 Quizzes/ tests

1 multi-choice quiz approximately every 2 weeks

1 Unit test per unit (multi choice and short answer)

Projects, Lab Activities, Homework, and Seatwork will also be assessed.
This course will be assessed on the following four categories:

- Tests and Quizzes (30%)
- Seatwork, Homework and Participation (30%)
- Quarter Exam (30%)
- Deportment (10%)

PRIMARY TEXTBOOK & OTHER RESOURCES

- **I will follow the following book for the (1st, 2nd, 3rd and 4th quarters).**

Text Book Title; Chemistry, 8th Edition Authors: Jill Robinson, John McMurry, and Robert FayJill Robinson • John McMurry. Published by Pearson (July 15th 2020) - Copyright © 2020.
https://media.pearsoncmg.com/ph/esm/esm_mcmurry_chemistry_8/msa/content/sbc/chapter.php?chapnum=2

ADDITIONAL INFORMATION – Please see Google Classroom for more information**.**

Class code: {Gr. 10 - St. Albert the Great; **tvsz62p**} and Class code: {Gr. 10 - St. Peter of Verona; **ymvpw76**}
Note: Student are required to buy a Ti-nspire CX Calculator I/II (non-CAS)

Schedule of Instructions

SUBJECT: Basic Chemistry

Text Book Title; Chemistry, Robinson, Jill | Mc Murry, John | Fay, Robert/ Chemistry, 8th Edition (USE).

Week / Date	Topic / Projects / Assessments
Week 1 **Aug 10th to 11th** **Only 2 School Days** *10 ~ First Day / Orientation Day*	**General Discussion about Basic Chemistry.** **Course introduction** Monday – Orientation in the morning. M/H School regular class after lunch Discussion of class rules, collecting text books from the library. **Chapter 2: Atoms Molecules and Ions.** 2.1: Chemistry and elements. 2.2: Periodic table 2.6: Atomic structure electrons, Protons and Neutrons. 2.8&2.9: Atomic number, atomic weights and the Mole. 2.10 Mass spectrometry. 2.12 Ions and Ionic Bonds.
Week 2 **Aug 14th to 18th** *15 ~ Opening Mass*	**Chapter 3: Mass Relationships in Chemical Reactions.** 3.1 Representing Chemistry on different levels. 3.2 Balancing Chemical Equations. 33.Molecular weight and molar mass. 3.4 Stoichiometry 3.5 Yields of chemical reactions. 3.6 Limiting reactant. 3.7 Empirical Formulas and Compositions. **Lab Work**
Week 3 **Aug 21st to 25th**	**Chapter 4: Reactions in Aqueous Solution:** 4.1 Molarity 4.3 Electrolytes 4.4Types of Chemical Reactions.
Week 4 **Aug 28th to Sep 1st**	4.5 Spectator Ion. 4.6 Solubility 4.7 Acid, Base and Neutralization Reactions.
Week 5 **Sep 4th to 8th**	4.9 Titration 4.10 Oxidation and Oxidation Number.

8 ~ Holy Mass & VIP Induction	4.11 Redox Reactions. **Lab Work**
Week 6 **Sep 11th to 15th** *12-14 ~ Pre-Exam Days*	**Chapter 5: Periodicity and the Electronic Structure of Atoms.** 5.1 electromagnetic Wave. 5.2 Photoelectric effect and Planck's Postulate. 5.3 Atomic line spectra and quantized energy. 5.4 De Broglie Hypothesis.
Week 7 **Sep 18th to 22nd**	5.5 Heisenberg's uncertainty principle. 5.6 Quantum Number. 5.7 Shapes of orbitals. **Lab Work**
Week 8 **Sep 25th to 29th** **No Classes** *25-28 ~Teacher's Conference* *29 – Moon Festival Holiday*	5.8 Pauli Exclusion principle. 5.9-5.13 Electron configurations and periodic Table.
Week 9 **Oct 2nd to 6th** **3 Days of Class** *5-6 ~Q1 Exams*	**Q1 EXAM**

2nd QUARTER – TENTATIVE COURSE CONTENT

Week / Date	Topic / Projects / Assessments
Week 1 (10) **Oct 9th to 13th** **3 Days of Class** *9-10 – Double 10 Holiday*	**Chapter 7: Covalent Bonding and Electron-Dot Structures.** 7.1-7.2 Covalent Bonding in Molecules. 7.3 Polar covalent Bonds. 7.4 Comparison of Ionic and covalent Bonding.
Week 2 (11) **Oct 16th to 20th**	7.5-7.9 Electron Dot Structure and their applications. 7.10 Formal Charges.
Week 3 (12) **Oct 23rd to 27th**	**Chapter 8: Covalent Compounds: Bonding Theories and Molecular Structure** 8.1 Molecular Shapes. 8.2 Valence Bond Theory. **Lab Work**
Week 4 (13) **Oct 30th to Nov 3rd** *1 - All Saint's Day Mass*	8.3 Hybridization 8.5 Polar Covalent Bonds and dipole moments.
Week 5 (14) **Nov 6th to 10th**	8.6 Intermolecular Forces.
Week 6 (15) **Nov 13th to 17th**	**Chapter 9: Thermochemistry: Chemical Energy.** 9.1Energy and its conservation. 9.5 Thermochemical equations and enthalpies. **Lab Work**
Week 7 (16) **Nov 20th to 24th**	9.7 Calorimetry and Heat Capacity 9.8 Hess's Law
Week 8 (17) **Nov 27th to Dec 1st**	9.10 Bond Dissociation Energies. 9.11&9.12 Gibbs free energy change.
Week 9 (18) **Dec 4th to 8th**	Review Chapter7,8&9

8 - Foundation Day Celebrations	
Week 10 (19) **Dec 11th to 15th** **3 Days of Class** *14-15 ~ Q2 Exams*	**Q3 EXAM**
Dec 18th to Jan 1st	**Christmas Holiday**

3rd QUARTER – TENTATIVE COURSE CONTENT

Week / Date	Topic / Projects / Assessments
Week 1 (20) **Jan 3rd to 5th** **3 Days of Class** *4 ~ New Year Mass*	**Chapter 14: Chemical Kinetics** 14.1 Reaction rates. 14.2 Rate Laws and Reaction Order.
Week 2 (21) **Jan 8th to 12th**	14.3 Method of Initial Rates 14.4-14.8 Integrated Rate Laws. **Lab Work**
Week 3 (22) **Jan 15th to 19th**	14.11 Rate Laws for overall reactions. 14.12-14.13 Catalysis
Week 4 (23) **Jan 22nd to 26th**	**Chapter 15: Chemical Equilibrium** 15.1 The Equilibrium state. 15.2 The Equilibrium Constant Kc
Week 5 (24) **Jan 29th to Feb 2nd**	15.3 The Equilibrium Constant Kp **Lab Work**
Week 6 (25) **Feb 5th to 9th** **3 Days of Class** *8-9 ~ CNY*	15.6 LeChatelier"s Principle.
Feb 8th to 16th	**CNY Holiday**
Week 7 (26) **Feb 19th to 23rd** *19 ~ Lenten Mass* *21-23 ~ Pre-Exam Days*	**Chapter 16: Aqueous Equilibria: Acids and Bases** 16.1 Acid-Base Concepts. 16.2 Acid-Base Strength
Week 8 (27) **Feb 26th to March 1st** **4 Days of Class** 28 ~ 228 Memorial Day Holiday	16.4 Dissociation of water 16.5 pH Scale **Lab Work**
Week 9 (28) **March 4th to 8th** **4 Days of Class** *8 ~ Q3 Exams*	16.13 Relation Between Ka &Kb

4th QUARTER – TENTATIVE COURSE CONTENT

Week / Date	Topic / Projects / Assessments
Week 1 (29) **March 11th to 15th** **4 Days of Class** *11 ~ Q3 Exams* *12 ~ Q4 Begins*	**Chapter 10: Gases: Their Properties and Behavior.** 10.1 Gases and Gas Pressure 10.2 The Gas Laws
Week 2 (30) **March 18th to 22nd** *18-21 ~ Fire Drill*	10.3 The Ideal Gas Law. 10.5 Daltons Law **Lab Work**
March 25th to Apr 5th	**Easter Holiday**
Week 3 (31) **Apr 8th to 12th** *10 ~ Easter Mass*	10.6 KMT of Gases 10.8 The Behavior of Real Gases.
Week 4 (33) **Apr 15th to 19th**	**Chapter 19 Electrochemistry.** **19.1 Balancing redox Reactions.**
Week 5 (34) **Apr 22th to 26th** 22-26 ~ AP Mock Exams	19.2 -19.3 Galvanic Cells. 19.4 Cell Potentials and Free Energy.
Week 6 (35) **Apr 29th to May 3rd** *1-2 ~ Pre-Exam* *1-10~ Final Exams (K, 5, 8, 12 only)* *4/29 – 5/10 ~ AP Exams*	19.5 Standard Reduction Potentials. 19.6 The Nernst Equation. **Lab Work**
Week 7 (36) **May 6th to 10th** *1-10~ Final Exams (K, 5, 8, 12 only)* *4/29 – 5/10 ~ AP Exams*	19.8 Electrochemical determination of Ph.
Week 8 (37) **May 13th to 17th** **2 Days of Class** *15-16 ~ Q4 Exams* *17 ~ Record Day*	**Q4 EXAM**
Week 9 (38) **May 20th to 24th** **ACTIVITIES**: ***Double check the school calendar and emails from the administration.***	**Review**
Week 10 (39) **May 27th to 31st** **ACTIVITIES**: ***Double check the school calendar and emails from the administration.***	**Field Trip, Graduation Day**