Dominican International School

AP Chemistry
COURSE SYLLABUS

GRADE LEVEL:11&12 SCHOOL YEAR:2023-2024

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

COURSE DESCRIPTION: The AP Chemistry course provides students with a college-level foundation to support future advanced course work in chemistry. Students cultivate their understanding of chemistry through inquiry-based investigations, as they explore topics such as: atomic structure, intermolecular forces and bonding, chemical reactions, kinetics, thermodynamics, and equilibrium.

COURSE OBJECTIVES: The key concepts and related content that define the AP Chemistry course and exam are organized around underlying principles called the Big Ideas. They encompass core scientific principles, theories, and processes that cut across traditional boundaries and provide a broad way of thinking about the particulate nature of matter underlying the observations students make about the physical world. The following are Ideas:

Idea 1: The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.

Idea 2: Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.

Idea 3: Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.

Idea 4: Rates of chemical reactions are determined by details of the molecular collisions.

Idea 5: The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.

Idea 6: Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.

ASSESSMENT:

Pop Quizzes will be conducted occasionally.
They will be given a chapter test after the completion of every chapter.
Quarter exam will be conducted at the end of each quarter.
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

Chemistry: The Central Science, 14th Edition
By Theodore E. Brown, H. Eugene LeMay, Bruce E. Bursten, Catherine Murphy, Patrick Woodward, Matthew E. Stoltzfus.
Published by Pearson, Copyright © 2018,
Published Date: Jan 4, 2017.

Laboratory Manuals

Cesa, Irene. ed. Flinn ChemTopic Labs: Experiments and Demonstrations in Chemistry. Batavia, IL: Flinn Scientific, 2002.
Randall, Jack. Advanced Chemistry with Vernier. Beaverton, OR: Vernier Software & Technology, 2004.
Vonderbrink, Sally Ann. Laboratory Experiments for Advanced Placement Chemistry. Batavia, IL: Flinn Scientific, 1995.
Demonstration Manuals
Bilash, Borislaw, II, George R. Gross, and John K. Koob. A Demo a Day: A Year of Chemical Demonstrations. Batavia, IL: Flinn Scientific, 1995.
Summerlin, Lee R., Christine L. Borgford, and Julie B. Ealy. Chemical Demonstrations: A Sourcebook for Teachers. 2nd ed. Vol. 2. Washington, DC: American Chemical Society, 1988.

Online Simulations and Resources

"Activities." The Concord Consortium. Accessed June 12, 2012. http://www.concord.org/activities.
"Animations Index." Chemical Education Research Group. Iowa State University. Accessed June 12, 2012. http://group.chem.iastate.edu/Greenbowe/sections/projectfolder/animationsindex.htm.
"AP Chemistry Course Home Page." AP Central. The College Board. Accessed June 12, 2019. http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2119.html

ADDITIONAL INFORMATION – Please see Google Classroom for more information.

Class code: **wragha7**

Note: Student are required to buy a Ti-nspire CX Calculator I/II (non-CAS)

Schedule of Instruction

SUBJECT: AP Chemistry

1st QUARTER – TENTATIVE COURSE CONTENT

Week / Date	Topic / Projects / Assessments
Week 1 **Aug 10th to 11th** **Only 2 School Days** *10 ~ First Day / Orientation Day*	**General Discussion about AP Chem.** **Course introduction** Wednesday – Orientation in the morning. M/H School regular class after lunch Discussion of class rules, collecting text books from the library
Week 2 **Aug 14th to 18th** *15 ~ Opening Mass*	**Unit 1: Atomic Structure** 1.1: The Mole 1.2: Mass Spectroscopy of Elements. 1.3 Elemental Composition of Pure Substances
Week 3 **Aug 21st to 25th**	1.4 Composition of Mixtures. 1.5 Atomic Structure and Electron Configuration 1.6 Photoelectron Spectroscopy 1.7 Periodic Trends
Week 4 **Aug 28th to Sep 1st**	1.8 Valence Electrons and Ionic Compounds **Unit Test**
Week 5 **Sep 4th to 8th** *8 ~ Holy Mass & VIP Induction*	**Unit 2: Molecular and Ionic Compound Structure and Properties**. 2.1 Types of Chemical Bonds 2.2 Intramolecular Force and Potential Energy. 2.3 Structure of Ionic Solids. 2.4 Structure of Metals and Alloys. 2.5 Lewis Diagrams. 2.6 Resonance and Formal Charge **Unit Test and Lab Work**
Week 6 **Sep 11th to 15th** *12-14 ~ Pre-Exam Days*	**Unit 3: Intermolecular Forces and Properties.** 3.1 Intermolecular Forces. 3.2 Properties of Solids. 3.3 Solids, Liquids, and Gases. 3.4 Ideal Gas Law. 3.5 Kinetic Molecular Theory. **Lab Work**
Week 7 **Sep 18th to 22nd**	3.6 Deviation from Ideal Gas Law. 3.7 Solutions and Mixtures. 3.8 Representations of Solutions. 3.9 Separation of Solutions and Mixtures Chromatography. 3.10 Solubility **Unit Test and Lab Work**
Week 8 **Sep 25th to 29th** **No Classes** *25-28 ~Teacher's Conference* *29 – Moon Festival Holiday*	3.11 Spectroscopy and the Electromagnetic Spectrum. 3.12 Photoelectric Effect. 3.13 Beer-Lambert Law. **Unit Test and Lab Work**
Week 9 **Oct 2nd to 6th** **3 Days of Class** *5-6 ~Q1 Exams*	**Review of all the lessons for 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*	**Unit 4: Chemical Reactions.** 4.1 Introduction for Reactions. 4.2 Net Ionic Equations. 4.3 Representations of Reactions. 4.4 Physical and Chemical Changes. 4.5 Stoichiometry **Unit Test and Lab Work**
Week 2 (11) **Oct 16th to 20th**	4.6 Introduction to Titration. 4.7 Types of Chemical Reactions. 4.8 Introduction to Acid-Base Reactions. 4.9 Oxidation-Reduction (Redox) Reactions. **Unit Test and Lab Work**
Week 3 (12) **Oct 23rd to 27th**	**Unit 5: Kinetics.** 5.1 Reaction Rates. 5.2 Introduction to Rate Law. 5.3 Concentration Changes Over Time. 5.4 Elementary Reactions. 5.5 Collision Model. 5.6 Reaction Energy Profile. **Unit Test and Lab Work**
Week 4 (13) **Oct 30th to Nov 3rd** *1 - All Saint's Day Mass*	5.7 Introduction to Reaction Mechanisms. 5.8 Reaction Mechanism and Rate Law. 5.9 Steady-State Approximation. 5.10 Multistep Reaction Energy Profile. 5.11 Catalysis. **Unit Test and Lab Work**
Week 5 (14) **Nov 6th to 10th**	**Unit 6: Thermodynamics** 6.1 Endothermic and Exothermic Processes. 6.2 Energy Diagrams. 6.3 Heat Transfer and Thermal Equilibrium. 6.4 Heat Capacity and Calorimetry. 6.5 Energy of Phase Changes. 6.6 Introduction to Enthalpy of Reaction. **Unit Test and Lab Work**
Week 6 (15) **Nov 13th to 17th**	6.7 Bond Enthalpies. 6.8 Enthalpy of Formation. 6.9 Hess's Law. **Unit Test and Lab Work**
Week 7 (16) **Nov 20th to 24th**	**Unit 7: Equilibrium** 7.1 Introduction to Equilibrium. 7.2 Direction of Reversible Reactions. **Unit Test and Lab Work**
Week 8 (17) **Nov 27th to Dec 1st**	7.3 Reaction Quotient and Equilibrium Constant. 7.4 Calculating the Equilibrium Constant. 7.5 Magnitude of the Equilibrium Constant. 7.6 Properties of the Equilibrium Constant. 7.7 Calculating Equilibrium Concentrations.

	Unit Test and Lab Work
Week 9 (18) **Dec 4th to 8th** 8 - Foundation Day Celebrations	7.8 Representations of Equilibrium. 7.9 Introduction to Le Châtelier's Principle. 7.10 Reaction Quotient and Le Châtelier's Principle. 7.11 Introduction to Solubility Equilibria. **Unit Test and Lab Work.**
Week 10 (19) **Dec 11th to 15th** **3 Days of Class** *14-15 ~ Q2 Exams*	7.12 Common-Ion Effect. 7.13 pH and Solubility. 7.14 Free Energy of Dissolution. **Unit Test and Lab Work.**
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*	**Unit 8: Acids and Bases** 8.1 Introduction to Acids and Bases. 8.2 pH and pOH of Strong Acids and Bases. 8.3 Weak Acid and Base Equilibria. 8.4 Acid-Base Reactions and Buffers. 8.5 Acid-Base Titrations. **Unit Test and Lab Work.**
Week 2 (21) **Jan 8th to 12th**	8.6 Molecular Structure of Acids and Bases. 8.7 pH and pK_a 8.8 Properties of Buffers. **Unit Test and Lab Work.**
Week 3 (22) **Jan 15th to 19th**	8.9 Henderson-Hasselbalch Equation. 8.10 Buffer Capacity. **Unit Test and Lab Work.**
Week 4 (23) **Jan 22nd to 26th**	**Unit 9: Applications of Thermodynamics** 9.1 Introduction to Entropy. 9.2 Absolute Entropy and Entropy Change. 9.3 Gibbs Free Energy and Thermodynamic Favorability. 9.4 Thermodynamic and Kinetic Control. **Unit Test and Lab Work.**
Week 5 (24) **Jan 29th to Feb 2nd**	9.5 Free Energy and Equilibrium. 9.6 Coupled Reactions. 9.7 Galvanic (Voltaic) and Electrolytic Cells. **Unit Test and Lab Work.**
Week 6 (25) **Feb 5th to 9th** **3 Days of Class** *8-9 ~ CNY*	9.8 Cell Potential and Free Energy. 9.9 Cell Potential Under Nonstandard Conditions. **Unit Test and Lab Work.**
Feb 8th to 16th	**CNY Holiday**
Week 7 (26) **Feb 19th to 23rd** *19 ~ Lenten Mass* *21-23 ~ Pre-Exam Days*	9.10 Electrolysis and Faraday's Law **Unit Test and Lab Work.**

Week 8 (27) **Feb 26th to March 1st** **4 Days of Class** 28 ~ 228 Memorial Day Holiday	**Review of all the lessons.**
Week 9 (28) **March 4th to 8th** **4 Days of Class** *8 ~ Q3 Exams*	**Review of all the lessons.**

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*	**Lab Practical Work and Review of all the selected problems,** **Third Quarter Exam**
Week 2 (30) **March 18th to 22nd** *18-21 ~ Fire Drill*	**Review; MCQ and Short answers questions 2014 to 2022 AP questions practice.**
March 25th to Apr 5th	**Easter Holiday**
Week 3 (31) **Apr 8th to 12th** *10 ~ Easter Masss*	**Review; MCQ and Short answers questions 2014 to 2022 AP questions practice.**
Week 4 (33) **Apr 15th to 19th**	**Review of all MCQ of the Lab Practical Work**
Week 5 (34) **Apr 22th to 26th** 22-26 ~ AP Mock Exams	**AP Mock Exams**
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*	**Review** (AP exams)
Week 7 (36) **May 6th to 10th** *1-10~ Final Exams (K, 5, 8, 12 only)* *4/29 – 5/10 ~ AP Exams*	**AP exams on Monday, May 1, 2023**
Week 8 (37) **May 13th to 17th** **2 Days of Class** *15-16 ~ Q4 Exams* *17 ~ Record Day*	**AP exams dates 4th Quarter Final Exam**
Week 9 (38) **May 20th to 24th** **ACTIVITIES: *Double check the school calendar and emails from the administration.***	**AP exams dates 4th Quarter Final Exam**
Week 10 (39) **May 27th to 31st** **ACTIVITIES: *Double check the school calendar and emails from the administration.***	**Gr. 9-11 Recognition and Gr. 12 Graduation** **Teachers/Staff Meeting**