Dubai International School-Al Quoz

Science Department (Grades 9-12)

Curriculum Annual Plan

Grade: 12 Subject: AP Chemistry 2024-2025

Semester-I

Big Idea	Enduring Understanding (EU)	Unit	Topic	Learning Objectives	Week No. & Date	No. of Lessons
			QUARTER- I			
			Diagnostic test Introduction to AP Chemistry Framework and External Exam framework AP Science Skills overview	**Revise** the concept of naming chemical compounds, solutions, and gas laws.	W1: 26/8 TILL 30/8	5
BIG IDEA 1	**SPQ-1**	**Unit-1: Atomic Structure**	1.1		W2: 2/9 TILL 6/9	5

BIG IDEA 2	The mole allows different units to be compared	**and properties**	**Moles and Molar Mass** **1.2 Mass Spectroscopy of Elements** **1.3 Elemental Composition of Pure Substances**	**Explain** the quantitative relationship between the mass spectrum of an element and the masses of the element's isotopes. **Calculate** quantities of a substance or its relative number of particles using dimensional analysis and the mole concept. **Explain** the quantitative relationship between the elemental composition by mass and the empirical formula of a pure substance.		
BIG IDEA 1 BIG IDEA 2	**SAP-1** Atoms and molecules can be identified by their electron distribution and energy.		**1.4 Composition of Mixtures** **1.5 Atomic Structure and Electron Configuration** **1.6 Photoelectron Spectroscopy**	**Explain** the relationship between the photoelectron spectrum of an atom or ion and: a. The electron configuration of the species. b. The interactions between the electrons and the nucleus. **Represent** the electron configuration of an element or ions of an element using the Aufbau principle.	W3: 9/9 TILL 13/9	5

				Explain the quantitative relationship between the elemental composition by mass and the composition of substances in a mixture.		
BIG IDEA 1 BIG IDEA 2	**SAP-1** Atoms and molecules can be identified by their electron distribution and energy.		**1.7** **Periodic Trends** **1.8** **Valence Electrons and Ionic Compounds**	**Explain** the relationship between trends in atomic properties of elements and electronic structure and periodicity. **Explain** the relationship between trends in the reactivity of elements and periodicity.	W4: 16/9 TILL 20/9	5
BIG IDEA 2	Structure and Properties SAP	**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**	**Explain** the relationship between the type of bonding and the properties of the elements participating in the bond. **Represent** the relationship between potential energy and distance between atoms, based on factors that influence the interaction strength. **Represent** an ionic solid with a particulate model that is consistent with Coulomb's law and the properties of the constituent ions.	W5: 23/9 TILL 27/9	5

			Structure of Metals and Alloys	**Represent** a metallic solid and/or alloy using a model to show essential characteristics of the structure and interactions present in the substance.		
BIG IDEA 2	Structure and Properties SAP		**2.5 Lewis Diagrams** **2.6 Resonance and Formal Charge** **2.7 VSEPR and Bond Hybridization**	**Represent** a molecule with a Lewis diagram. **Represent** a molecule with a Lewis diagram that accounts for resonance between equivalent structures or that uses formal charge to select between nonequivalent structures. Based on the relationship between Lewis diagrams, VSEPR theory, bond orders, and bond polarities: a. **Explain** structural properties of molecules. b. **Explain** electron properties of molecules.	W6: 30/9 TILL 4/10	5
BIG IDEA 1 BIG IDEA 2	**SAP-7** Gas properties are explained macroscopically—using the relationships among pressure, volume, temperature, moles, gas constant—and	**UNIT 3: Intermolecular Forces and Properties**	**3.1 Intermolecular Forces** **3.2 Properties of Solids**	**Explain** the relationship between the chemical structures of molecules and the relative strength of their intermolecular forces when: a. The molecules are of the same chemical species. b. The molecules are of two different chemical species. **Explain** the relationship among the macroscopic properties of a substance, the particulate-level structure of the substance, and the interactions between these particles.	W7: 7/10 TILL 11/10	5

	molecularly by the motion of the gas.		**3.3 Solids, Liquids, and Gases** **3.4 Ideal Gas Law** **3.5 Kinetic Molecular Theory**	**Represent** the differences between solid, liquid, and gas phases using a particulatelevel model. **Explain** the relationship between the macroscopic properties of a sample of gas or mixture of gases using the ideal gas law. **Explain** the relationship between the motion of particles and the macroscopic properties of gases with: a. The kinetic molecular theory (KMT). b. A particulate model. c. A graphical representation.		
BIG IDEA 1 BIG IDEA 2	**SAP-7** Gas properties are explained macroscopically—using the relationships among pressure, volume, temperature, moles, gas constant—and molecularly by the motion of the gas.		**3.6 Deviation from Ideal Gas Law** **3.7 Solutions and Mixtures** **3.8 Representations of Solutions**	**Explain** the relationship among non-ideal behaviors of gases, interparticle forces, and/or volumes. **Calculate** the number of solute particles, volume, or molarity of solutions. Using particulate models for mixtures: a. **Represent** interactions between components. b. **Represent** concentrations of components.	W8: 14/10 TILL 18/10	5

			3.9 Separation of Solutions and Mixtures Chromatography	**Explain** the relationship between the solubility of ionic and molecular compounds in aqueous and nonaqueous solvents, and the intermolecular interactions between particles.		
BIG IDEA 1 BIG IDEA 2	**SAP-7** Gas properties are explained macroscopically—using the relationships among pressure, volume, temperature, moles, gas constant—and molecularly by the motion of the gas.		**3.10 Solubility** **3.11 Spectroscopy and the Electromagnetic Spectrum** **3.12 Photoelectric Effect** **3.13 Beer-Lambert Law**	**Explain** the relationship between the solubility of ionic and molecular compounds in aqueous and nonaqueous solvents, and the intermolecular interactions between particles. **Explain** the relationship between a region of the electromagnetic spectrum and the types of molecular or electronic transitions associated with that region. **Explain** the properties of an absorbed or emitted photon in relationship to an electronic transition in an atom or molecule. **Explain** the amount of light absorbed by a solution of molecules or ions in relationship to the concentration, path length, and molar absorptivity.	W9: 21/10 TILL 25/10	5
END OF QUARTER-I						

Big Idea	Enduring Understanding (EU)	Unit	Topic	Learning Objectives	Week No. & Date	No. of Lessons
QUARTER- II						
BIG IDEA 1 & 3	**TRA-2** A substance can change into another substance through different processes, and the change itself can be classified by the sort of processes.	**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**	**Identify** evidence of chemical and physical changes in matter. **Represent** changes in matter with a balanced chemical or net ionic equation: a. For physical changes. b. For given information about the identity of the reactants and/or product. c. For ions in a given chemical reaction. **Represent** a given chemical reaction or physical process with a consistent particulate model. **Explain** the relationship between macroscopic characteristics and bond interactions for: a. Chemical processes. b. Physical processes. **Explain** changes in the amounts of reactants and products based on the balanced reaction equation for a chemical process.	W10: 28/10 TILL 1/11	5

			4.6 Introduction to Titration **4.7 Types of Chemical Reactions** **4.8 Introduction to Acid-Base Reactions** **4.9 Oxidation-Reduction (Redox) Reactions**	**Identify** the equivalence point in a titration based on the amounts of the titrant and analyte, assuming the titration reaction goes to completion. **Identify** a reaction as acidbase, oxidation-reduction, or precipitation. **Identify** species as Brønsted-Lowry acids, bases, and/or conjugate acid-base pairs, based on proton-transfer involving those species. **Represent** a balanced redox reaction equation using half-reactions.	W11: 4/11 TILL 8/11	5
BIG IDEA-3	**TRA-3** Some reactions happen quickly, while others happen more slowly and depend on reactant concentrations and temperature.	**Unit 5: Reaction kinetics**	**5.1 Reaction Rates** **5.2 Introduction to Rate Law**	**Represent** experimental data with a consistent rate law expression. **Identify** the rate law expression of a chemical reaction using data that show how the	W12: 11/11 TILL 15/11	5

			5.3 Concentration Changes Over Time **5.4 Elementary Reactions**	concentrations of reaction species change over time. **Represent** an elementary reaction as a rate law expression using stoichiometry. **Represent** the activation energy and overall energy change in an elementary reaction using a reaction energy profile.		
BIG IDEA-3	**TRA-4** There is a relationship between the speed of a reaction and the collision frequency of particle collisions **TRA-5** Many chemical reactions occur through a series of elementary reactions.		**5.5 Collision Model** **5.6 Reaction Energy Profile** **5.7 Introduction to Reaction Mechanisms** **5.8**	**Identify** the components of a reaction mechanism. **Explain** the two conditions necessary for chemical reactions to occur. **Identify** the rate law for a reaction from a mechanism in which the first step is rate limiting. **Relate** the order of a reaction to the rate law for the reaction. **Explain** and write rate laws for chemical reactions.	W13: 18/11 TILL 22/11	5

			Reaction Mechanism and Rate Law			
BIG IDEA-3	**TRA-4** There is a relationship between the speed of a reaction and the collision frequency. **TRA-5** Many chemical reactions occur through a series of elementary reactions.		**5.9 Steady-State Approximation** **5.10 Multistep Reaction Energy Profile** **5.11 Catalysis**	**Identify** the rate law for a reaction from a mechanism in which the first step is not rate limiting. **Represent** the activation energy and overall energy change in a multistep reaction with a reaction energy profile. **Explain** the relationship between the effect of a catalyst on a reaction and changes in the reaction mechanism.	W14: 25/11 TILL 29/11	5
BIG IDEA 4	**ENE-2** Changes in a substance's properties or change into a different substance requires an exchange of energy.	**Unit 6: Thermodynamics**	**6.1 Endothermic and Exothermic Processes** **6.2 Energy Diagrams**	**Explain** the relationship between experimental observations and energy changes associated with a chemical or physical transformation. **Represent** a chemical or physical transformation with an energy diagram.	W15: 4/12 TILL 6/12	5

			6.3 **Heat Transfer and Thermal Equilibrium**	**Explain** the relationship between the transfer of thermal energy and molecular collisions.		
BIG IDEA 4	**ENE-2** Changes in a substance's properties or change into a different substance requires an exchange of energy. **ENE-3** The energy exchanged in a chemical transformation is required to break and form bonds.		**6.4** **Heat Capacity and Calorimetry** **6.5** **Energy of Phase Changes** **6.6** **Introduction to Enthalpy of Reaction**	**Calculate** the heat q absorbed or released by a system undergoing heating/ cooling based on the amount of the substance, the heat capacity, and the change in temperature. **Explain** changes in the heat q absorbed or released by a system undergoing a phase transition based on the amount of the substance in moles and the molar enthalpy of the phase transition. **Calculate** the heat q absorbed or released by a system undergoing a chemical reaction in relationship to the amount of the reacting substance in moles and the molar enthalpy of reaction.	W16: 9/12 TILL 13/12	5
WINTER BREAK						
BIG IDEA 4	**ENE-2** Changes in a substance's properties or change into a different	**Unit 6: Thermodynamics**	**6.7** **Bond Enthalpies**	**Calculate** the heat q absorbed or released by a system undergoing heating/ cooling based on the amount of the substance, the heat capacity, and the change in temperature.	W17: 6/1 TILL 10/1	5

	substance requires an exchange of energy. **ENE-3** The energy exchanged in a chemical transformation is required to break and form bonds.		**6.8 Enthalpy of Formation** **6.9 Hess's Law**	**Calculate** the enthalpy change for a chemical or physical process based on the standard enthalpies of formation. **Represent** a chemical or physical process as a sequence of steps. **Explain** enthalpy change, enthalpy of reaction, enthalpy of formation, and enthalpy of combustion.		
BIG IDEA 1&3	**TRA-6** Some reactions can occur in both forward and reverse directions, sometimes proceeding in each direction simultaneous. **TRA-7** A system at equilibrium depends on the relationships between concentrations,	**Unit 7: Equilibrium**	**7.1 Introduction to Equilibrium** **7.2 Direction of Reversible Reactions** **7.3 Reaction Quotient and Equilibrium Constant**	**Provide** reasoning to justify a claim using chemical principles or laws or using mathematical justification. **Explain** the relationship between the occurrence of a reversible chemical or physical process, and the establishment of equilibrium, to experimental observations. **Relate** the direction in which a reversible reaction proceeds to the relative rates of the forward and reverse reactions.	W18: 13/1 TILL 17/1	5

	partial pressures of chemical species, and equilibrium constant *K*.		**7.4 Calculating the Equilibrium Constant**	**Represent** the reaction quotient Qc or Qp, for a reversible reaction, and the corresponding equilibrium. **Calculate** Kc or Kp based on experimental observations of concentrations or pressures at equilibrium. **Explain** the relationship between the direction in which a reversible reaction proceeds and the relative rates of the forward and reverse reactions.		
BIG IDEA 1 BIG IDEA 3	**TRA-8** Systems at equilibrium respond to external stresses to offset the effect of the stress.		**7.5 Magnitude of the Equilibrium Constant** **7.6 Properties of the Equilibrium Constant** **7.7**	**Explain** the relationship between very large or very small values of K and the relative concentrations of chemical species at equilibrium. **Represent** a multistep process with an overall equilibrium expression, using the constituent K expressions for each individual reaction. **Represent** a system undergoing a reversible reaction with a particulate model.	20-24/01/2024 **(22/01/2023 LDI) (23-26/01/2023 Revision) 24/01 1st day of exams)**	5

			Calculating Equilibrium Concentrations **7.8 Representations of Equilibrium**	**Identify** the concentrations or partial pressures of chemical species at equilibrium based on the initial conditions and the equilibrium constant.		
END OF QUARTER-II						