

Grade	Unit No.	Unit Name	Topic Name	NC SLO Name	Domain	NCP SLO (Revised)
9	1	Fundamentals of Chemistry	Branches of Chemistry	Identify and provide examples of different branches of chemistry.	Nature of Science in Chemistry	[SLO: C-09-A-01]-Define chemistry as the study of matter, its properties, composition and interactions with other matter and energy. Or study of Earth (solids), Air(gases), Sea (liquids) and sky (plasma) and their interaction with each other.
9	1	Fundamentals of Chemistry	Branches of Chemistry	Differentiate between branches of chemistry.		[SLO: C-09-A-02] evidence and logical reasoning to develop Explain with examples that scientific theories. For chemistry has many sub-fields and example, chemists based interdisciplinary fields.
9	1	Fundamentals of Chemistry	Branches of Chemistry	Distinguish between matter and a substance.		[SLO: C-09-A-03] Formulate examples of essential questions that are important for the branches of Chemistry (e.g. for Analytical Chemistry a question would be 'how can we accurately determine the chemical composition of a sample?') The Practice of Science:
9	1	Fundamentals of Chemistry	Branches of Chemistry	Find the number of valence electrons in an atom using the Periodic Table.		[SLO: C-09-A-04] Differentiate between 'science', 'technology' and 'engineering' by making reference to examples from the physical sciences.
9	1	Fundamentals of Chemistry	Branches of Chemistry	Define atomic number, atomic mass, atomic mass unit.		Physical Chemistry (States of Matter)
9	1	Fundamentals of Chemistry	Basic Definitions	Differentiate among elements, compounds and mixtures.	Physical Chemistry (Atomic Structure)	[SLO: C-09-B-02]State the distinguishing macroscopic properties of commonly observed states of solids, liquids and gases in particular density, compressibility and fluidity.
9	1	Fundamentals of Chemistry	Basic Definitions	Define relative atomic mass based on C-12 scale.		[SLO: C-09-B-03] Identify that state is a distinct form of matter
9	1	Fundamentals of Chemistry	Basic Definitions	Differentiate between empirical and molecular formula		[SLO: C-09-B-04] Explain the allotropic forms of solids
9	1	Fundamentals of Chemistry	Basic Definitions	Distinguish between atoms and ions.		[SLO: C-09-B-05] Explain the differences between elements, compounds and mixtures.
9	1	Fundamentals of Chemistry	Basic Definitions	Differentiate between molecules and molecular ions.		[SLO: C-09-B-06] Identify solutions, colloids, and suspensions as mixtures and give an example of each
9	1	Fundamentals of Chemistry	Chemical Species	Distinguish between ion and free radical.		[SLO: C-09-B-07] Explain the effect of temperature on solubility and formation of unsaturated and saturated solutions
9	1	Fundamentals of Chemistry	Chemical Species	Classify the chemical species from given examples.		[SLO: C-09-B-08] Explain the structure of the atom as a central nucleus containing neutrons and protons surrounded by electrons in shells
9	1	Fundamentals of Chemistry	Avogadro's Number and Mole	Identify the representative particles of elements and compounds.		[SLO: C-09-B-09] State that, orbits (shells) are energy levels of electrons and a larger shell implies higher energy and greater average distance from nucleus
9	1	Fundamentals of Chemistry	Avogadro's Number and Mole	Relate gram atomic mass, gram molecular mass and gram formula mass to mole.		[SLO: C-09-B-10]State that electrons are quantum particles with probabilistic paths whose exact paths and locations cannot be mapped (with reference to the uncertainty principal).
9	1	Fundamentals of Chemistry	Avogadro's Number and Mole	Describe how Avogadro's number is related to a mole of any substance.		[SLO: C-09-B-11] Explain that a nucleus is made up of protons and neutrons held together by strong nuclear force
9	1	Fundamentals of Chemistry	Chemical Calculations	Distinguish among the terms gram atomic mass, gram molecular mass and gram formula mass.	[SLO: C-09-B-12] Explain that an atomic model is an aid to understand the structure of an atom.	
9	1	Fundamentals of Chemistry	Chemical Calculations	Change atomic mass, molecular mass and formula mass into gram atomic mass, gram molecular mass and gram formula mass.	[SLO: C-09-B-13]State the relative charge andrelative masses of a subatomic particles (an electron, proton and neutron)	
9	1	Fundamentals of Chemistry	Chemical Calculations	Calculate the number of representative particles in a given number of moles of any substance.	[SLO: C-09-B-14] Interpret the relationship between a subatomic particle, their mass and charge.	
9	1	Fundamentals of Chemistry	Chemical Calculations	Calculate the number of moles in a given number of representative particles of any substance.	[SLO: C-09-B-15] Illustrate the path that positively and negatively charged particles would take under the influence of a uniform electric field.	
9	1	Fundamentals of Chemistry	Chemical Calculations	Calculate the mass of one mole of any substance.	[SLO: C-09-B-16] Define proton number/atomic number as the number of protons in the nucleus of an atom.	
9	1	Fundamentals of Chemistry	Chemical Calculations	Calculate the mass of a given number of moles of a substance.	[SLO: C-09-B-17] Explain that the proton number is unique to each element and used to arrange elements in periodic table	
9	1	Fundamentals of Chemistry	Chemical Calculations	Calculate the number of moles in a given mass of a substance.	[SLO: C-09-B-18] State that radioactivity can change the proton number and alter an atom's identity	
9	2	Structure of Atoms	Theories and Experiments Related to Atomic Structure	Describe the contributions that Rutherford made to the development of the atomic theory.	[SLO: C-09-B-19] Define nucleon number/atomic mass as sum of number of protons and neutrons in the nucleus of an atom.	
9			Theories and Experiments Related to Atomic Structure	Explain how Bohr's atomic theory differed from it.	[SLO: C-09-B-20] Define isotopes as different atoms of the same element that have same number of protons but different neutrons	
9			Theories and Experiments Related to Atomic Structure	Describe the structure of an atom including the location of the proton, electron and neutron.	[SLO: C-09-B-21] State that isotopes can affect molecular mass but not chemical properties of an atom	

9			Isotopes	Define isotopes.		[SLO: C-09-B-22] Determine the number of protons and neutrons of different isotopes
9			Isotopes	Compare isotopes of an atom.		[SLO: C-09-B-23] Define relative atomic mass as the average mass of isotopes of an element compared to 1/12 of mass of an atom of Carbon-12
9			Isotopes	Discuss properties of the isotopes of H, C, Cl, U		[SLO: C-09-B-24] State that isotopes can exhibit radioactivity
9			Isotopes	Draw the structure of different isotopes from mass number and atomic number.		[SLO: C-09-B-25] Discuss the importance of isotopes using carbon dating and medical imaging as examples.
9			Isotopes	State the importance and uses of isotopes in various fields of life.		[SLO: C-09-B-26] Describe the formation of positive (cation) and negative (anion) ions from atoms.
9			Electronic Configuration	Describe the presence of sub shells in a shell.		[SLO: C-09-8-27] Interpret and use the symbols for atoms and ions
9			Electronic Configuration	Distinguish between shells and sub shells.		[SLO: C-09-8-28] Calculate relative atomic mass of an element from relative masses and abundance of isotopes.
9			Electronic Configuration	Write the electronic configurations of the first 18 elements in the Periodic Table.		[SLO: C-09-B-29] calculate the relative mass of an isotope given relative atomic mass and abundance of all stable isotopes.
9	3	Periodic Table and Periodicity of Properties	Periodic Table	Distinguish between a period and a group in the periodic table.	(Chemical Bonding)	[SLO: C-09-B-30] Describe that noble gas electronic configuration, octet and duplet rules help predict chemical properties of main group elements
9			Periodic Table	State the periodic law.		[SLO: C-09-B-31] Compare between the formation of cations and anions
9			Periodic Table	Classify the elements (into two categories: groups and periods) according to the configuration of their outer most electrons.		[SLO: C-09-B-32] Account for the electropositive and electronegative nature of metals and non metals.
9			Periodic Table	Determine the demarcation of the periodic table into an s block and p block.		[SLO: C-09-B-33] Define ionic, covalent, coordinate covalent and metallic bonds
9			Periodic Table	Explain the shape of the periodic table.		[SLO: C-09-8-34] Differentiate between ionic compounds and covalent compounds.
9			Periodic Table	Determine the location of families on the Periodic Table.		[SLO: C-09-8-35] Explain the properties of compounds in terms of bonding and structure
9			Periodic Properties	Recognize the similarity in the chemical and physical properties of elements in the same family of elements.		[SLO: C-09-8-36] Compare uses and properties of materials such as strength and conductivity as determined by the type of chemical bond present between their atoms.
9			Periodic Properties	Identify the relationship between electron configuration and the position of an element on the periodic table.		[SLO: C-09-B-37] Interpret the strength of forces of attraction and their impact on melting and boiling points of ionic and covalent compounds.
9			Periodic Properties	Explain how shielding effect influences periodic trends.		[SLO: C-09-8-38] Justify the availability of free charged particles (electrons or ions) for conduction of electricity in ionic compounds (solid and molten) covalent compounds and metallic bonds.
9			Periodic Properties	Describe how electronegativities change within a group and within a period in the periodic table.		[SLO: C-09-8-39] Recognize that some substances can ionize when dissolved in water.
9			Periodic Properties	Describe how the atomic radii vary within a group and within a period of the periodic table.		[SLO: C-09-8-40] Justify the suitability of usage of graphite, diamond and metals for industrial purposes.
9			Periodic Properties	Describe how the ionization energies vary within a group and within a period of the periodic table.		[SLO: C-09-8-41] Draw the structure of ionic and covalent compounds along with their formation.
9			Periodic Properties	Explain how scientists can build on one another's works.		[SLO: C-09-B-42] State the formulae of common elements and compounds.
9	4	Structure of Molecules	Why do Atoms React?	Find the number of valence electrons in an atom using the Periodic Table.	(Stoichiometry)	[SLO: C-09-8-43] Define molecular formula of a compound as the number and type of different atoms in one molecule
9			Why do Atoms React?	Describe the importance of noble gas electronic configurations.		[SLO: C-09-8-44] Define empirical formula of a compound as the simplest whole number ratio of different atoms in a molecule.
9			Why do Atoms React?	State the octet and duplet rules.		[SLO: C-09-B-45] Deduce the formula and name of a binary ionic compounds from ions given relevant information.
9			Why do Atoms React?	Explain how elements attain stability.		[SLO: C-09-B-46] Deduce the formula of a molecular substance from the given structure of molecules.
9			Chemical Bonds	Describe the ways in which bonds may be formed.		[SLO: C-09-B-47] Use the relationship amount of substance = mass / molar mass to calculate number of moles, mass, molar mass, relative mass (atomic/molecular/formula) and number of particles
9			Chemical Bonds	State the importance of noble gas electronic configurations in the formation of ion.		[SLO: C-09-B-48] Define mole as amount of substance containing avogadro's number (6.02x10 ²³) of particles
9			Chemical Bonds	Describe the formation of cations from an atom of a metallic element.		[SLO: C-09-8-49] Explain the relationship between a mole and Avogadro's constant
9			Chemical Bonds	Describe the formation of anions from an atom of a non-metallic element.		[SLO: C-09-B-50] Construct chemical equations and ionic equations to show reactants forming products, including state
9			Types of Bonds	Describe the characteristics of an ionic bond.		[SLO: C-09-B-51] Deduce the symbol equation with state symbols for a chemical reaction given relevant information.
9			Types of Bonds	Recognize a compound as having ionic bonds.		[SLO: C-09-B-52] Define redox reactions as simultaneous oxidation and reduction in terms of oxygen, hydrogen, electrons and changes in oxidation state
					(Electro Chemistry)	

9			Types of Bonds	Identify characteristics of ionic compounds.		[SLO: C-09-B-53] Use roman numerals to indicate oxidation number of an element in a compound
9			Types of Bonds	Describe the formation of a covalent bond between two non metallic elements.		[SLO: C-09-B-54] Identify oxidizing and reducing agents in a redox reaction
9			Intermolecular Forces	Describe with examples single, double and triple covalent bonds.		[SLO: C-09-B-55] Recognize that the oxidation number of elements in their free state is zero
9			Nature of bonding and properties	Draw electron cross and dot structures for simple covalent molecules containing single, double and triple covalent bonds.		[SLO: C-09-B-56] Derive the formula of ionic compounds from ionic charges and oxidation numbers
9			Nature of bonding and properties	Explain the need for different synthetic adhesives like glues and epoxy resins		[SLO: C-09-B-57] Identify that the oxidation number of monatomic ion is the same as the charge on the ion
9			Nature of bonding and properties	Explain how aircrafts, cars, trucks and boats are partially held together with epoxy adhesives.		[SLO: C-09-B-58] Explain that the sum of the oxidation numbers in a neutral compound is zero
9	5	Physical States of Matter	Gaseous State	Effect on the pressure of a gas by a change in the a. volume b. temperature.		[SLO: C-09-B-59] Explain that the sum of the oxidation numbers in an ion is equal to the charge on the ion
9			Gaseous State	Compare the physical states of matter with regard to intermolecular forces present between them.		[SLO: C-09-B-60] Identify redox reactions by the colour changes involved when using acidified aqueous potassium manganate(VII) to (1) or aqueous potassium iodide
9			Gaseous State	Account for pressure-volume changes in a gas using Boyle's Law.	Electro Chemistry (Real World Application)	[SLO: C-09-B-61] Define corrosion and discuss methods to prevent it. (some examples may include barrier method such as using paint galvanizing, electroplating; sacrificial protection such as using magnesium blocks in ships).
9			Gaseous State	Account for temperature-volume changes in a gas using Charles's Law.	Energetics	[SLO: C-09-B-622] Explain the idea of a chemical system and its connection with its surroundings influences energy transfer during a chemical reaction.
9			Gaseous State	Explain the properties of gases (diffusion, effusion and pressure).		[SLO: C-09-B-63] Differentiate between exothermic and endothermic reactions by giving examples.
9			Liquid state	Summarize the properties of liquids like evaporation, vapor pressure, boiling point		[SLO: C-09-B-64] State that thermal energy is called enthalpy change and recognize its sign as negative for exothermic and positive for endothermic reactions
9			Liquid state	Explain the effect of temperature and external pressure on vapor pressure and boiling point.		[SLO: C-09-B-65] Define activation energy as the minimum energy that colliding particles must have for a successful collision.
9			Solid state	Describe physical properties of solids (melting and boiling points).		[SLO: C-09-B-66] Explain that activation energy depends on reaction pathway which can be changed using catalysts or enzyme (detailed pathways not required)
9			Solid state	Differentiate between amorphous and crystalline solids.		[SLO: C-09-B-67] Draw, label and interpret reaction pathway diagram for exothermic and endothermic reaction which includes enthalpy change, activation energy (uncatalyzed and catalyzed), reactants and products
9			Solid state	Explain the allotropic forms of solids.		[SLO: C-09-B-68] Recognize that bond breaking is endothermic and bond making is exothermic processes.
9			Solid state	Determine melting point of organic solids.		[SLO: C-09-B-69] explain that enthalpy change is sum of energies absorbed and released in bond breaking and bond forming
9			Solid state	Determine boiling point of organic liquids.		[SLO: C-09-B-70] Calculate enthalpy change of a reaction given bond energy values
9			Solid state	Carry out sublimation.		[SLO: C-09-B-71] Explain how respiration (aerobic and anaerobic), an exothermic process, provides energy for biological systems and lipids as reserve stores of energy.
9			Solid state	Explain how instrumentation changes as science progresses.	Equilibria	[SLO: C-09-B-72] Recognize that reversible reaction are shown by symbol = and may not go to completion
9			Solid state	Explain how curing with salts helps preserve meat.		[SLO: C-09-B-73] Describe how changing the physical conditions of a chemical equilibrium system can redirect reversible reactions.
9			Solid state	Explain how scientists use the power of reasoning to explain their observations.		[SLO: C-09-B-74] State that reversible reaction can achieve equilibrium in a closed system when rate of forward and backward reactions are equal.
9	6	Solutions	Solution, aqueous solution, solute, and solvent	Define the terms: solution, aqueous solution, solute and solvent and give an example of each.	Acid Base Chemistry and PH	[SLO: C-09-B-75] Define Bronsted-Lowry acids as proton donors and Bronsted-Lowry bases as proton acceptors.
9			Saturated, unsaturated, supersaturated solutions and dilution of solution	Explain the difference between saturated, unsaturated and supersaturated solutions.		[SLO: C-09-B-76] Recognize that aqueous solutions of acids contain H ⁺ ions and aqueous solutions of alkalis contain OH ⁻ ions

9			Types of solution	Explain the formation of solutions (mixing gases into gases, gases into liquids, gases into solids) and give an example of each.	Inorganic Chemistry (Periodic Table and periodicity)	[SLO: C-09-B-77] Define a strong acid and bases as an acid or base that completely dissociates in aqueous solution and weak acid and base that partially dissociates in aqueous solution. (Some examples include: Student writing symbol equation to show these for hydrochloric acid, sulphuric acid, nitric acid, and ethanoic acid.
9			Concentration Units	Explain what is meant by the concentration of a solution.		[SLO: C-09-B-78] Formulate dissociation equations for an acid or base in aqueous solution.
9			Concentration Units	Define Molarity.		[SLO: C-09-B-79] Recognize that bases are oxides or hydroxides of metals and that alkalis are water-soluble bases
9			Concentration Units	Define percentage solution.		[SLO: C-09-B-80] Describe the characteristic properties of acids in terms of their reactions with metals, bases and carbonates.
9			Concentration Units	Solve problems involving the Molarity of a solution.		[SLO: C -09- 81] Identify the characteristic properties of bases in terms of their reactions with acids and ammonium salts
9			Concentration Units	Describe how to prepare a solution of given Molarity.		[SLO: C-09-B-82] Define acid rain.
9			Concentration Units	Describe how to prepare dilute solutions from concentrated solutions of known Molarity.		[SLO: C-09-B-83] Discuss effects of acid rain and relate them with properties of acids.
9			Concentration Units	Convert between the Molarity of a solution and its concentration in g/dm ³		[SLO: C-09-C-01] Define the periodic table as an arrangement of elements in periods and groups in order of increasing proton number / atomic number
9			Comparison of Solutions, Suspension, and Colloids	Use the rule that "like dissolves like" to predict the solubility of one substance in another.		[SLO: C -09- 03] Identify the group or period or block of an element using its electronic configuration (only the idea of subshells related to the blocks can be introduced)
9			Comparison of Solutions, Suspension, and Colloids	Define colloids and suspensions.		[SLO: C-09-C-03] Explain the relationship between group number and the charge of ions formed from elements in the group in terms of their outermost shells
9			Comparison of Solutions, Suspension, and Colloids	Differentiate between solutions, suspension and colloids.		[SLO: C -09- 04] Explain similarities in the chemical properties of elements in the same. group in terms of their electronic configuration
9			Comparison of Solutions, Suspension, and Colloids	Prepare solutions of different strength.		[SLO: C-09-C-05] Identify trends in group and periods, given information about the elements, including trends for atomic radius, electron affinity, electronegativity, ionization energy, metallic character, reactivity and density
9			Comparison of Solutions, Suspension, and Colloids	Carry out dilution of solutions.		[SLO: C-09-C-06] Use terms alkali metals, alkaline earth metals, halogens, noble gases, transition metals, lanthanides and actinides in reference to the periodic table.
9			Comparison of Solutions, Suspension, and Colloids	Relate solutions to different products in their community.		[SLO: C-09-07] Predict the characteristic properties of an element in a given group by using knowledge of chemical periodicity.
9	7	Electrochemistry	Oxidation and reduction	Define oxidation and reduction in terms of loss or gain of oxygen or hydrogen.	Group Properties and Elements	[SLO: C-09-C-08] Deduce the nature, possible position in the Periodic Table and the identity of unknown elements from given information about their physical and chemical properties
9			Oxidation and reduction	Define oxidation and reduction in terms of loss or gain of electrons.		[SLO: C-09-C-09] Define Group I Alkali metals as relatively soft metals with general trends down the group limited to decreasing melting point, increasing density and increasing reactivity
9			Oxidizing and Reducing Agents	Identify the oxidizing and reducing agents in a redox reaction.		[SLO: C-09-C-10] Predict properties of other elements in group I, given information about the elements.
9			Oxidizing and Reducing Agents	Define oxidizing and reducing agents in a redox reaction.		[SLO: C-09-C-11] Predict properties of elements in group I in order of reactivity given relevant information.
9			Oxidation States and Rules for Assigning Oxidation States	Define oxidation state.		Group VII Properties [SLO: C-09-C-12] Define group VII halogens as diatomic non-metals with general trends limited to increasing density, and decreasing reactivity.
9			Oxidation States and Rules for Assigning Oxidation States	State the common rules used for assigning oxidation numbers to free elements, ions (simple and complex), molecules, atoms.		[SLO: C-09-C-13] Identify the appearance of halogens at rtp as fluorine as pale yellow gas, chlorine as yellow-green gas, bromine as red-brown liquid, iodine as grey/black solid.
9			Oxidation States and Rules for Assigning Oxidation States	Determine the oxidation number of an atom of any element in a compound.		
9			Oxidation- Reduction Reactions	Identify the half-cell in which oxidation occurs and the half-cell in which reduction occurs given a voltaic cell.		
9			Electrochemical Cells	Describe the nature of electrochemical processes.		

9			Electrochemical Cells	Sketch an electrolytic cell, label the cathode and the anode.	
9			Electrochemical Cells	Identify the direction of movement of cations and anions towards respective electrodes.	
9			Electrochemical Cells	List the possible uses of an electrolytic cell.	
9			Electrochemical Cells	Sketch a Daniell cell, labeling the cathode, the anode, and the direction of flow of the electrons.	
9			Electrochemical Cells	Describe how a battery produces electrical energy.	
9			Electrochemical Cells	Distinguish between electrolytic and voltaic cells.	
9			Electrochemical Industries	Describe the methods of preparation of alkali metals.	
9			Electrochemical Industries	Describe the manufacture of sodium metal from fused NaCl.	
9			Electrochemical Industries	Identify the formation of by products in the manufacture of sodium metal from fused NaCl.	
9			Electrochemical Industries	Describe the method of recovering metal from its ore.	
9			Electrochemical Industries	Explain electrolytic refining of copper.	
9			Corrosion and its Prevention	Define corrosion.	
9			Corrosion and its Prevention	Describe rusting of iron as an example of corrosion.	
9			Corrosion and its Prevention	Summarize the methods used to prevent corrosion.	
9			Corrosion and its Prevention	Explain electroplating of metals on steel (using examples of zinc, Tin and chromium plating).	
9			Corrosion and its Prevention	Determine which solutions conduct electricity given a set of different solutions.	
9			Corrosion and its Prevention	Perform metal displacement reactions in aqueous medium.	
9			Corrosion and its Prevention	Compare the effects of Al ₂ O ₃ and Fe ₂ O ₃ formation on their parent metals and cite examples from daily life.	
9			Corrosion and its Prevention	Explain how the food and beverage industries deal with corrosion.	
9			Corrosion and its Prevention	Explain how chemistry interacts with photography.	
9			Corrosion and its Prevention	Explain how decorative and practical objects containing silver can differ significantly in their properties and durability depending on whether they are solid silver, thickly plated with silver or thinly plated with silver.	
9	8	Chemical Reactivity	Non-Metals	Show how cations and anions are related to the terms metals and non-metals.	
9			Metals	Explain why alkali metals are not found in the free state in nature.	
9			Metals	Identify elements as an alkali metal or an alkaline earth metal.	
9			Metals	Explain the differences in ionization energies of alkali and alkaline earth metals.	
9			Metals	Describe the position of sodium in Periodic Table, its simple properties and uses.	
9			Metals	Describe the position of calcium and magnesium in Periodic Table, their simple properties and uses.	
9			Metals	Differentiate between soft and hard metals (Iron and Sodium).	
9			Metals	Describe the inertness of noble metals.	
9			Metals	Identify the commercial value of Silver, Gold and Platinum.	
9			Metals	Compile some important reactions of halogens.	
9			Metals	Name some elements, which are found in uncombined state in nature.	
9			Metals	Qualitatively analyze cations (NH ₄ ⁺ , Ca ⁺² , Mg ⁺² , Ba ⁺² , Zn ⁺)	
9			Metals	Explain the uses of noble metals for jewel and coins.	
10	9	Chemical Equilibrium	Reversible Reactions and Dynamic Equilibrium	Define chemical equilibrium in terms of a reversible reaction.	
10			Reversible Reactions and Dynamic Equilibrium	Write both the forward and the reverse reactions and describe the macroscopic characteristics of each.	

10			Law of mass action and Derivation of the expression for the equilibrium constant	Define Law of mass action	
10			Equilibrium Constant and its units	Derive an expression for the equilibrium constant and its units.	
10			Importance of Equilibrium Constant	State the necessary conditions for equilibrium and the ways that equilibrium can be recognized.	
10			Importance of Equilibrium Constant	Write the equilibrium constant expression of a reaction.	
10			Importance of Equilibrium Constant	Write the equilibrium expression for a given chemical reaction.	
10			Importance of Equilibrium Constant	Explain how components of the atmosphere can be used successfully in producing important chemicals.	
10	10	Acids, Bases and Salts	Concepts of Acids, Bases	Define and give examples of Arrhenius acids and bases.	
10			Concepts of Acids, Bases	Use the Bronstad-Lowry theory to classify substances as acids or bases, or as proton donors or proton acceptors.	
10			Concepts of Acids, Bases	Classify substances as Lewis acids or bases.	
10			Concepts of Acids, Bases	Write the equation for the self-ionization of water.	
10			Concepts of Acids, Bases	Given the hydrogen ion or hydroxide ion concentration, classify a solution as neutral, acidic, or basic.	
10			Concepts of Acids, Bases	Complete and balance a neutralization reaction.	
10			Concepts of Acids, Bases	Use litmus paper, pH paper and other indicators for measuring pH of solutions.	
10			Concepts of Acids, Bases	Perform acid base titrations and related calculations.	
10			Concepts of Acids, Bases	Identify areas of work for analytical chemists.	
10			Concepts of Acids, Bases	Explain why the quantity of preservatives in food is restricted by government regulations.	
10			pH Scale	Explain pH-dependent foods.	
10			pH Scale	Explain process of etching in art and industry.	
10			pH Scale	Explain the reactions between industrial pollutants and atmospheric water leading to formation of acids.	
10			pH Scale	Describe harmful effects of acid rain.	
10			pH Scale	Explain Stomach acidity	
10	11	Organic Chemistry	Organic Compounds	Recognize structural, condensed, and molecular formulas of the straight chain hydrocarbons up to ten carbon atoms.	
10			Organic Compounds	Identify some general characteristics of organic compounds.	
10			Organic Compounds	Explain the diversity and magnitude of organic compounds.	
10			Sources of Organic Compounds	List some sources of organic compound	
10			Uses of Organic Compounds	List the uses of organic compounds	
10			Uses of Organic Compounds	Recognize and identify a molecule's functional groups.	
10			Uses of Organic Compounds	Distinguish between saturated and unsaturated hydrocarbons.	
10			Alkanes and Alkyl Radicals	Name the alkanes up to decane.	
10			Alkanes and Alkyl Radicals	Convert alkanes into alkyl radicals.	
10			Alkanes and Alkyl Radicals	Differentiate between alkanes and alkyl radicals.	
10			Functional Groups	Define functional group.	
10			Functional Groups	Differentiate between different organic compounds on the basis of their functional groups.	
10			Functional Groups	Classify organic compounds into straight chain, branched chain and cyclic compounds.	

10			Functional Groups	Identify carboxylic acids, phenols, amines, aldehydes and ketones in terms of functional groups in the lab.	
10			Functional Groups	Distinguish between saturated and unsaturated compounds using iodine, bromine and Potassium permanganate solutions.	
10			Functional Groups	Show how pharmaceutical chemists work towards the partial and total synthesis of effective new drugs.	
10			Functional Groups	Explain how substances produced by plants and animals can also be produced in the lab.	
10	12	Hydrocarbons	Alkanes	Explain why a systematic method of naming chemical compounds is necessary.	
10			Alkanes	Characterize a hydrocarbon.	
10			Alkanes	Draw electron cross and dot structures of simple alkanes.	
10			Alkanes	Write a chemical equation to show the preparation of alkanes from hydrogenation of alkenes and alkynes and reduction of alkyl halides	
10			Alkanes	Draw structural formulas of alkanes, alkenes and alkynes up to 5 carbon atoms.	
10			Alkenes	Write a chemical equation to show the preparation of alkenes from dehydration of alcohols and dehydrohalogenation of alkyl halides.	
10			Alkynes	Write a chemical equation to show the preparation of alkynes from Dehalogenation of 1,2-dihalides and tetrahalides	
10			Alkynes	Write chemical equations showing halogenation for alkanes, alkenes and alkynes	
10			Alkynes	Write chemical equations showing reaction of KMnO ₄ with, alkenes and alkynes	
10			Alkynes	Determine the boiling point of alcohol.	
10			Alkynes	Explain hydrocarbons as fuel.	
10			Alkynes	Explain Hydrocarbons as feed stock in industry	
10	13	Biochemistry	Carbohydrates	Distinguish between mono-, di- and trisaccharides.	
10			Proteins	Describe the bonding in a protein molecule.	
10			Proteins	Explain the sources and uses of carbohydrates, proteins, and lipids.	
10			Lipids	Differentiate between fats and oil.	
10			Nucleic acids	Describe the importance of nucleic acids.	
10			Vitamins	Define and explain vitamins and their importance.	
10			Vitamins	Check the relative solubility in water of starch and sugar.	
10			Vitamins	Observe and explain the denaturing of proteins.	
10			Vitamins	Explain why agricultural and nutritional sciences are vital	
10			Vitamins	Explain the use of natural products in the preparation of flavors, fragrances, resins and pharmaceuticals.	
10			Vitamins	List and describe the commercial uses of enzymes.	
10			Vitamins	Explain hydrogenation of vegetable oil.	
10			Vitamins	Explain the use of dextrose in drips.	
10	14	Environmental Chemistry I: Atmosphere	Composition of Atmosphere	Define atmosphere.	
10			Composition of Atmosphere	Explain composition of atmosphere.	
10			Layers of Atmosphere	Differentiate between stratosphere and troposphere.	
10			Layers of Atmosphere	Summarize the components of stratosphere and troposphere.	
10			Air Pollutants	Describe major air pollutants.	
10			Air Pollutants	Describe sources and effects of air pollutants.	
10			Ozone depletion and its effects	Explain ozone formation.	
10			Ozone depletion and its effects	Describe ozone depletion and its effects.	

10			Acid rain and its effects	Describe acid rain and its effects	
10			Acid rain and its effects	Describe global warming.	
10			Acid rain and its effects	Perform filtration experiments in the lab on different water samples having suspended impurities.	
10			Acid rain and its effects	Explain how incineration of waste material contributes to the problem of air pollution.	
10			Acid rain and its effects	Debate whether the government should do more to control air pollution resulting from auto exhaust.	
10	15	Environmental Chemistry II: Water	Properties of Water	Describe the occurrence of water and its importance in the environment including industry.	
10			Properties of Water	Review our dependence on water and the importance of maintaining its quality.	
10			Water as Solvent	Describe the composition and properties of water.	
10			Soft and Hard Water	Differentiate among soft, temporary and permanent hard water.	
10			Types of Hardness of Water	Describe methods for eliminating temporary and permanent hardness of water.	
10			Disadvantages of Water Hardness	Explain how hard water hampers the cleansing action of soap.	
10			Methods of Removing Hardness	Explain how and why water treatment is essential for water to be drinkable.	
10			Methods of Removing Hardness	Compare modern water treatment and sewage treatment centers and processes.	
10			Methods of Removing Hardness	Explain how chemistry helps maintain a clean swimming pool.	
10			Water Pollution	Identify water pollutants.	
10			Water Pollution	Describe industrial wastes and household wastes as water pollutants.	
10			Water Pollution	Describe the effects of these pollutants on life.	
10			Water borne diseases	Describe the various types of water borne diseases.	
10			Water borne diseases	Test water quality by checking its color, odor, hardness and conductivity.	
10			Water borne diseases	Determine boiling point of water.	
10	16	Chemical Industries	Basic Metallurgical Operations	Describe some metallurgical operations.	
10			Solvay Process	Make a list of raw materials for Solvay process.	
10			Solvay Process	Outline the basic reactions of Solvay process.	
10			Solvay Process	Develop a flow sheet diagram of Solvay process.	
10			Urea	Describe the composition of urea.	
10			Urea	Develop a flow sheet diagram for the manufacture of urea.	
10			Urea	List the uses of urea.	
10			Petroleum Industry	Define petroleum	
10			Petroleum Industry	Describe the formation of petroleum and natural gas.	
10			Petroleum Industry	Describe the composition of petroleum.	
10			Petroleum Industry	Describe briefly the fractional distillation of petroleum.	
10			Petroleum Industry	Relate the study of chemistry to careers in industry.	
10			Petroleum Industry	Describe the link between chemistry, business and communication skills in order to promote chemical sales.	
10			Petroleum Industry	Describe how different types of fire (wood, oil, electric) require different chemistry to put them out.	
10			Petroleum Industry	Explain how technology impacts the production of common chemicals.	

10		Petroleum Industry	Debate the use of synthetic fertilizers versus organic I natural fertilizers.	
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