

Chemistry

Class - XI

Sr. No.	Periods	Topic	Subject Matter	Activities
1.	15	Some Basic concepts of Chemistry	Importance of studying Chemistry, Precision and significant figures, Laws of Chemical Combinations, Dalton's Atomic Theory, Avogadro's Hypothesis, Mole Concept, Atomic and Molecular masses, Percentage Composition, Empirical & Molecular Formulae. Balancing of chemical Equations by Hit & Trial method.	(1) Visualise the difference in precision and accuracy by using measuring cylinder and thermometer (with the help of your friends). (2) Weigh 1 mole of different substances and make your observations.

			Stoichiometry, Calculations base upon Stoichiometry.	
2.	18	Atomic Structure	Discovery of fundamental particles, Thompson model and its limitations, Atomic No., Atomic mass, Isotopes, Isobars, Isotones, Rutherford's Atomic model and its limitations, Nature of electromagnetic radiations, Emission spectrum of Hydrogen. Bohr's Atomic model and its limitations, Concept of shells, sub-shells, Dual nature of matter and light. de-Broglie's relationship, Davisson and Germer experiment, Heisenberg's uncertainty principle, Concept	(1) Visualise light by passing through prism. (2) Observe the different characteristic colours of metals by flame test. (3) See the changes in spectrum of light by prism after passing through different coloured solutions.

			of orbitals. Quantum numbers, shapes of s, p and d- orbitals. Rules of filling electrons in orbitals. Aufbau's principle Bohr-Bury's rule, Pauli's exclusion principle, Hund's rule of maximum multiplicity Electronic configuration of atoms, Stability of half and fully filled atomic orbitals.	(4) With the help of Ball and beads construct a model of atom (Bohr model and showing distribution of electrons in different shells).
3.	08	Classification of Elements and periodicity in properties	Significance of classification, Historical development of modern periodic table, Periodic trends in properties of elements (Atomic radii, Ionisation enthalpy, Electron gain Enthalpy, Electronegativity and valency.	* Prepare the Chart of modern periodic table and show metals, metalloids and non-metals using different colours.
4.	16	Chemical	Types of bonds, bond	* With the help of your

		Bonding & Molecular Structure	<p>parameter, Lewis structure of co-valent bond Resonance structures, Geometry of co-valent molecules, VSEPR theory, Polarity, Concept of hybridization (qualitative treatment of sp, sp^2, sp^3, dsp^2, sp^3d, and sp^3d^2) Valance-Bond theory, molecular orbital theory of diatomic molecules (Qualitative idea).</p> <p>Weak forces of interactions (Hydrogen bonding, V-waal's forces, dipolar-interactions).</p>	<p>friends construct models of tetrahedral, square planar, trigonal bipyramidal and octahedral shape. (Ball and Stick model).</p>
5.	14	States of Matter- Gases and Liquids	<p>States of matter, :- measurable properties, Gas Laws, Ideal Gas Equation, Kinetic molecular theory, Deviation of real gases from</p>	<p>* Construct a device to measure pressure in a balloon.</p>

			<p>ideal behaviour, Vander-Waal's equation (brief idea), Liquification of Gases, Critical temperature,</p> <p><u>Liquid State</u> :- Vapour Pressure, Viscosity, Surface Tension, (qualitative idea only).</p>	<p>* Compare properties like Viscosity, Vapour Pressure, Surface Tension of common liquids around you by observing them. Check your observations by comparing the reported data.</p>
6.	16	Thermodynamics	<p>Concept of system, types of system, surrounding, work, heat, energy, Extensive and Intensive properties, State functions, Irreversible process, First law of</p>	<p>* Observe the temperature changes when NaOH, NH₄Cl & Glucose are dissolved in water.</p>

			<p>Thermodynamics, Concept of Internal Energy and Enthalpy, Heat capacity, Hess's law of Constant Heat summation, Enthalpy of bond dissociation, formation, combustion, atomization, various phase transition, Ionization and Dilution.</p> <p>Introduction of Entropy as a state function, Free Energy Change for spontaneous and non-spontaneous reaction, Equilibrium.</p>	<p>* List the process happening around you which involve change in Entropy.</p>
7.	16	Equilibrium	<p>Equilibrium in Physical and Chemical process, Dynamic nature of Equilibrium, Law of Chemical Equilibrium, Derivations of relationship</p>	<p>* Observe the movement of blue colour in two beakers containing water, connected by a tube.</p>

			<p>between K_p and K_c. Le-Chatelier's Principle, Equilibrium involving ions, Various concept of Acids and Bases (Arrhenius Concept, Bronsted Lowry and Lewis Concept) Dissociation of Acids and Bases. Ionisation of water, pH scale, Hydrolysis of salts, pH calculation of salt solution, Solubility product, Common Ion Effect, Elementary idea of Buffer solution.</p>	<p>* Discuss among your classmates the practical utility of LeChatelier's principle.</p> <p>* With the help of your teacher observe the effect of concentration on equilibrium in a reaction between Fe^{+3} and SCN^- ion when oxalic acid is added to it at equilibrium.</p>
8.	06	Redox Reaction	<p>Concept of Oxidation and Reduction. Redox reactions in aqueous medium, Calculation of Oxidation number. Balancing of Chemical equations by Oxidation</p>	<p>* Observe the change in colour when :</p> <p>(i) rxn between Zn and aqueous solution of Copper Nitrate in a beaker.</p>

			Number and ion-electron method.	
9.	06	Principles and Processes of Extraction of Elements	Modes of occurrence, Chemical principles underlying – Concentration of ores, Reduction, Oxidation, Refining of Metals.	* With the help of your teacher identify the elements from a local sample of soil. *Separate a mixture of Iron, NaCl and Sand.
10.	07	Hydrogen	Unique position of hydrogen in periodic table, Occurrence, Isotopes, Dihydrogen, Preparation (including commercial preparation) Properties, Chemical Reaction and uses. Hydrides – Molecular, Saline and Interstitial. Water – Structure and	*Prepare hydrogen gas and fill it in balloon with the help of your teacher. * Observe hardness of local water by using soap.

			<p>aggregation of water molecules, Physical and Chemical properties, Hard and Soft Water, Water Softner, Heavy Water.</p> <p>Hydrogen Peroxide, Hydrogen Economy, Use of Liquid Hydrogen as a fuel.</p>	
11.	12	s-Block Elements	<p>General Introduction to s-block elements- abundance, occurrence, anomalous properties of first element of each group, diagonal relationship, Electronic configuration, variation of properties (Ionisation Enthalpy, atomic and ionic radii). Reactivity and electrode potential. Reactions</p>	<p>* Add a piece of Na in water and check the acidic and basic nature of the solution so formed.</p> <p>* Perform a reaction between Na_2CO_3 and H_2SO_4 and pass the gas through lime water and record the changes occurred.</p>

			<p>with Oxygen, Hydrogen, Halogens and Liquid Ammonia, Basic nature of Oxides and Hydroxides.</p> <p>Preparation, Properties and uses of Na_2CO_3, NaHCO_3, NaOH, NaCl and CaCO_3.</p> <p>Biological properties of Na, K, Mg and Calcium.</p> <p>Industrial uses of CaO and CaCO_3.</p> <p>Uses of Lime, Lime Stone and Cement.</p>	* Observe the setting of cement.
12.	12	Some p-Block Elements	General properties of Group-13 Elements Anomalous behaviour of first Element,	* Design an experiment to check whether HNO_3 can be stored in

		<p>Diagonal relationship.</p> <p>Boron – Physical and Chemical properties, some important compounds (Borax, Boric Acid, Boron Hydride).</p> <p>Aluminium – Uses, reaction with acid and alkalies. Extraction of Aluminium.</p> <p>Group –14 Elements General properties, Carbon- allotropic forms, Physical and Chemical properties, tetravalency, catenation, uses of Oxides. Important compounds of Silicon and few uses :- Silicon Tetrachloride, Silicones, Silicates and</p>	<p>Aluminium vessel or not.</p> <p>* With the help of your teacher, explain the working of five extinguisher.</p>
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			Zeolites. Extraction of Tin and Lead.	
13.	14	Organic Chemistry :- Some Basic Principles and Techniques	Classification of IUPAC nomenclature of Organic compounds. Electronic displacement in co-valent bond. Inductive effect, Electromeric effect, Resonance and Hyper-conjugation, Homolytic and Hetrolytic bond fission of a Covalent Bond. Free radicals, Carbocation, Carbanion, Electrophite, Nucleophile, Types of Organic reactions. General introduction of	* Add Silver Nitrate solution to Carbon Tetrachloride and NaCl(aq.) and observe the changes. *Purify I ₂ and camphor by sublimation.

			methods of purification (Qualitative and Quantitative Analysis).	
14.	14	Hydrocarbons	<p>Classification of Hydrocarbons:-</p> <p><u>Alkanes</u> : Nomenclature, Isomerism, Conformations of Ethane, preparation Physical properties, Chemical reactions of alkanes(including Free Radical, Mechanism of Halogenation, Combustion and Pyrolysis).</p> <p><u>Alkenes</u> : Nomenclature, Structure of Double Bond (Ethene) Geometrical Isomerism, Physical properties, Methods of preparation, Chemical reactions, Mechanism of</p>	<p>* Burn the samples of Benzene and Hexane and observe the products formed.</p> <p>* Prepare a model of Ethane (with the help of Balls and Sticks) and observe the conformations.</p> <p>* Observe the Geometrical Isomerism in Alkene by Ball and Stick model.</p>

		<p>Electrophilic addition, Markownikoff's Rule, Peroxide Effect, Ozonolysis, Oxidation.</p> <p><u>Alkynes</u> : Nomenclature, Structure of triple bond (Ethyne). Physical properties, Methods of preparation, Chemical reaction, Acidic Nature of Alkynes, Addition reaction with H₂, Halogens, Hydrogen Halides and water.</p> <p><u>Aromatic Hydrocarbons</u> : Introduction, Nomenclature, Benzene, Resonance, Aromaticity, Chemical properties, Mechanism of Electrophilic Substitution (Nitration, Sulphonation, Halogenation, Friedal Craft</p>	<p>* Show the directive influence of substituents in mono- substituted Benzene with the help of electric model.</p>
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			Alkylation and Acylation. Directive influence of functional group in mono-substituted Benzene, Carcinogenicity and Toxicity.	
15.	06	Environmental Pollution	Air, Water and Soil Pollution – Chemical reactions in atmosphere, Smog, Atmospheric Pollutants, Acid rains, Ozone and its reactions. Effects of depletion of Ozone layer, Green House Effect and Global Warming. Pollution due to Industrial Waste, Green chemistry as an alternative tool for reducing pollution, Strategy for control of Environmental Pollution.	<ul style="list-style-type: none"> * With the help of your classmates make a summary of the water pollutants of your locality. Suggest remedial measures. * Case study of nearby Industry (Chemical or Cement etc.) to see and observe the industrial effluents. * Write your views about the ban of polythene in Himachal Pradesh.

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Chemistry

Class - XII

Sr.	Unit/	Topic	Subject Matter	Activities
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No.	Period s			
1.	14	Unit-I Solid State	Classification of solids based on different binding forces :- molecular, ionic, co-valent and metallic solids, Amorphous and Crystalline solids (Elementary ideas). Unit cell in two dimensional and three dimensional lattices, Calculation of density of unit cells. Packing of solids, voids, Number of atoms (particles) per unit cell in a cubic unit cell. Point defects. Electrical and magnetic properties. Structure of simple ionic compounds of AB and AB ₂ types	* Construct a model of simple cubic unit cell and calculate the number of particles per unit cell. * Cut the glass and the crystal of Potash Alum and observe the edges.

2.	11	Unit-II Solutions	Types of solutions, expression of concentration of solutions of solids in liquid, Solubility of gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, Elevation in boiling point, depression in freezing point and Osmotic pressure. Determination of molecular mass of solutes using colligative properties. Abnormal molecular masses.	<p>* Enlist the examples of the solution of gases in liquids and explain the effect of temperature and pressure on the solubility.</p> <p>* With the help of your teacher prepare the solution of Vinegar.</p> <p>*Observe the effect of adding different amounts of NaCl on the lowering of temperature of ice.</p>
3.	14	Unit-III Electrochemistry	Electrolytic Galvanic cells, Electrolysis and law of Electrolysis, Electrolytic Conduction, Conductance, Conductivity, Molar Conductivity.	* Prepare Electrolytic cell with the help of your classmates and observe the changes occurred.

			<p>Kohlrausch's law and its applications, Galvonic cell, Elctrode potential, Electromotive force, Nernst Equations, Primary and Secondary cells including fuel cells, Corrosion and its prevention.</p>	
4.	12	Unit-IV Chemical Kinetics	<p>Average and instantaneous rate of reaction, rate expression and order of reaction, Factor affecting rate of reaction Integrated rate equation of zero and first order reaction and their derivations, half life period.</p> <p>Temperature dependence of rate constant-Arrhenius</p>	<p>* Observe the rate of reaction of slow and fast reactions with suitable examples i.e. Reaction between NaCl (aq) and AgNO₃ (aq.) and rusting of iron.</p> <p>* Observe the effect of temperature and surface area on dissolution of sugar in</p>

			equation, Activation energy, Collision theory (Elementary idea, No mathematical treatment).	water.
5.	09	Unit-V Surface Chemistry	Adsorption – Physical and Chemical Adsorption, Factors affecting the rate of Adsorption, Effect of pressure and effect of temperature (qualitative idea only), Catalysis, Enzymes, Zeolites, Colloids, distinction between true solutions, colloids and suspensions. Classifications based upon dispersion medium and dispersed phase. Types of Colloids, lyophilic and Lyophobic. Multi-molecular, Macro-molecular and associated	* Explain the process of adsorption by taking the example of paper Chromatography. * Perform decolourising of sugar solution with the help of animal Charcol. * Study the tyndall effect in water, milk and sand solution.

			colloids (micelles). Methods of preparation of colloids and their properties. Emulsions-types (oil in water and water in oil), emulsifiers.	
6.	14	Unit-VI p-Block Elements	<p><u>Group – 15 Elements</u></p> <p>General introduction, electronic configurations, occurrence, oxidation states, trends in physical and Chemical properties, <u>Nitrogen</u> – Preparation, properties and uses, compounds of nitrogen:- Preparation and properties of NH_3 and HNO_3, Oxides of nitrogen (structures only). <u>Phosphorous</u> – Allotropic forms, compounds of Phosphorous :- Preparation and properties of</p>	-----

			<p>Phosphines, halides (PCl_3 , PCl_5) and oxoacids (elementary idea only).</p> <p><u>Group – 16 Elements</u> General introduction, electronic configurations, occurrence, oxidation states, trends in physical and Chemical properties, Dioxygen :– Preparation, properties and uses of SO_2 , H_2SO_4 (Industrial process of manufacture), Oxoacids of Sulphur (structures only).</p> <p><u>Group – 17 Elements</u> General introduction, Electronic configurations, oxidation states, occurrence,</p>	<p>----</p> <p>-----</p>
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			<p>trends in Physical and Chemical properties, Compounds of halogens – Preparation, properties and uses of Chlorine and Hydrochloric Acid, Interhalogen compounds, Oxoacids of Halogens (structures only).</p> <p><u>Group –18 Elements</u> General introduction, electronic configuration, occurrence, trends in Physical and Chemical properties, uses.</p>	-----
7	14	Unit-VII d & f – Block Elements.	<p><u>d-Block elements</u> Electronic configuration and characteristics of the transition elements, General</p>	-----

			<p>trends in the Chemistry of first row transition elements (metallic character, Ionisation enthalpy, electrode potential, oxidation states, ionic radii, catalytic properties, colour, complex formation, magnetic properties, interstitial compounds alloy formation).</p> <p>Occurrence and principles of extraction of Iron, Copper, Zinc. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.</p> <p><u>Lanthanoids</u> : Introduction, oxidation states, chemical reactivity, Lanthanoid contraction.</p>	-----
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			Actinoids : Introduction, electronic configuration oxidation states.	
8.	12	Unit-VIII Co-ordination Compounds	Introduction, Ligands, Co-ordination number, IUPAC nomenclature mono-nuclear co-ordination compounds, Isomerism including stereo-isomerism. Bonding V.B. approach, shapes, colour magnetic properties, crystal field theory (qualitative idea only) Idea of stability of co-ordination compounds. Importance of co-ordination compounds [in qualitative analysis, extraction of metals and biological systems (Chlorophyll, vitamin B ₁₂ and	-----

			haemoglobin)].	
9.	12	Unit-IX Haloalkanes & Haloarenes	<p><u>Haloalkanes</u> : Nomenclature, nature of C-X bond, physical and chemical properties, Mechanism of substitution reactions.</p> <p><u>Haloarenes</u> : Nomenclature, Nature of C-X bond, Methods of preparation of haloarenes substitution reaction (directive influence of halogen for monosubstituted compounds only). Uses and environmental effects of – dichlormethane, trichloro-methane, tetrachloromethane, Iodoform, Freon and DDT.</p>	<p>* Discuss the uses and harmful effects of DDT and Freon.</p> <p>* Prepare Sodium Extract in laboratory and detect the Halogens in Alkyl Halides.</p>
10.	14	Unit-X Alcohols,	<u>Alcohols</u> : Nomenclature, methods of preparation,	* Analyse acidic nature of alcohols and

		<p>Phenols & Ethers</p>	<p>physical and chemical properties (of primary alcohols). Mechanism of dehydration, identifications of primary secondary and tertiary alcohols. Some important compounds methanol and Ethanol. Uses of Alcohols.</p> <p><u>Phenols</u> : Nomenclature, methods of preparation, physical and chemical properties. Acidic nature of Phenols. Electrophillic substitution reactions, Uses of Phenol.</p> <p><u>Ether</u> : Nomenclature, methods of preparation, physical and chemical</p>	<p>phenols. * With the help of your teacher prepare Ethyl Alcohol by fermentation method.</p>
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			properties, uses.	
11.	12	Unit-XI Aldehydes, Ketones and Carboxylic Acids	<p><u>Aldehydes and Ketones :</u> Electronic structure of carbonyl group. Nomenclature, important methods of preparation, Physical properties. Chemical Reactions:- reactivity of aldehydic and ketonic groups, aldol condensation, cross aldol condensation, cannizaro's reaction, mechanism of Nucleophilic addition reaction to $>C=O$ group.</p> <p><u>Carboxylic Acids :</u> Nomenclature important methods of preparation,</p>	* Observe the pleasant smell evolved during esterification of carboxylic acid.

			<p>physical properties and effect of substituents on Acidic strength.</p> <p>Chemical reaction – mechanism of Esterification.</p>	
12.	11	<p>Unit – XII Organic Compounds containing Nitrogen</p>	<p>Structure of amino groups (Primary, Secondary and Tertiary) Nomenclature, important methods of preparation, Physical properties, Basic character of Amines, chemical reactions – separation and identification of primary, secondary and tertiary Amines. <u>Nitro Compounds</u> : Methods of preparation and chemical reactions (Reductions and</p>	-----

			<p>hydrolysis).</p> <p><u>Cyanides and Isocyanides :</u> Structure of cyanides and isocyanide groups. Nomenclature, preparation and physical properties. Chemical properties (Reduction and Hydrolysis). <u>Diazoniun Salts</u> : Methods of preparation, importance in synthetic organic chemistry.</p>	
13.	12	Unit – XIII Biomolecules	<p><u>Carbohydrates</u> - Classification, structure and simple chemical reaction of Glucose and Fructose. Anomeric carbon, mutarotation, <u>Disaccharides</u> - reducing and non-reducing sugars,</p>	<p>* Observe the denaturation of proteins in egg, when it is boiled. * Prepare a chart of diseases caused by the deficiency of various vitamins. * Observe the</p>

			<p>Sucrose, Maltose, Lactose.</p> <p><u>Polysaccharides</u> - Starch, Cellulose and Glycogen.</p> <p><u>Proteins</u> : α-Amino acids, peptide bond, polypeptides, Primary, secondary, tertiary and quaternary structure of protein. De-naturation of Proteins and Enzymes.</p> <p><u>Vitamins</u> : Classifications and functions.</p> <p><u>Nucleic Acids</u> : Types, Chemical Composition of DNA and RNA. Primary structure of DNA and its double Helix structure.</p>	<p>denaturation of milk when citric acid is added to it and boiled.</p> <p>* Test for reducing sugars – Fehling solution, Benedicts solution test etc.</p>
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14.	08	Unit – XIV Polymers	<p>Classification of Polymers, General methods of Polymerisation (addition, free-radical, anionic and cationic polymerization) Condensation polymerization, co-polymerisation.</p> <p>Rubber – Natural and synthetic, vulcanization of Rubber. Some commercially important polymers, Natural and synthetic polymers like – Polythene, Nylon, Polyester, Bakelite, Rubber.</p>	<p>* Enlist various natural and synthetic polymers around you.</p> <p>* Discuss the uses and harmful effects of polymers among your classmates.</p>
15.	11	Unit – XV Chemistry in Everyday Life	<p><u>Chemicals in medicines and health care</u> : Analgesic tranquiliser, antiseptic, disinfectants, antimicrobials, antifertility drugs,</p>	<p>* Prepare the first aid box with the help of your teacher and enlist the contents.</p>

			<p>antihistamines, antibiotics, antacids.</p> <p><u>Chemicals in food :</u> Preservatives, artificial sweetening agents, antioxidants.</p> <p><u>Cleansing Agents :</u> Soaps and detergents, cleansing action.</p>	
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