COURSE STRUCTURE
Class XI (Theory)

One Paper
Time: 3 Hours
70 marks

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Title</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>Unit I</td>
<td>Some Basic Concepts of Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Unit II</td>
<td>Structure of Atom</td>
<td>6</td>
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<tr>
<td>Unit III</td>
<td>Classification of Elements and Periodicity in Properties</td>
<td>4</td>
</tr>
<tr>
<td>Unit IV</td>
<td>Chemical Bonding and Molecular Structure</td>
<td>5</td>
</tr>
<tr>
<td>Unit V</td>
<td>States of Matter: Gases and Liquids</td>
<td>4</td>
</tr>
<tr>
<td>Unit VI</td>
<td>Thermodynamics</td>
<td>6</td>
</tr>
<tr>
<td>Unit VII</td>
<td>Equilibrium</td>
<td>6</td>
</tr>
<tr>
<td>Unit VIII</td>
<td>Redox Reactions</td>
<td>3</td>
</tr>
<tr>
<td>Unit IX</td>
<td>Hydrogen</td>
<td>3</td>
</tr>
<tr>
<td>Unit X</td>
<td>s-Block Elements</td>
<td>5</td>
</tr>
<tr>
<td>Unit XI</td>
<td>Some s-Block Elements</td>
<td>5</td>
</tr>
<tr>
<td>Unit XII</td>
<td>Organic Chemistry: Some basic Principles and Techniques</td>
<td>7</td>
</tr>
<tr>
<td>Unit XIII</td>
<td>Hydrocarbons</td>
<td>8</td>
</tr>
<tr>
<td>Unit XIV</td>
<td>Environmental Chemistry</td>
<td>3</td>
</tr>
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<td><strong>Total</strong></td>
<td><strong>70</strong></td>
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Unit: Some Basic Concepts of Chemistry (Periods 14)
General Introduction: Importance and scope of chemistry.
Historical approach to particulate nature of matter, laws of chemical combination,
Dalton's atomic theory: concept of elements, atoms and molecules.
Atomic and molecular masses, mole concept and molar mass, percentage composition,
empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit II: Structure of Atom (Periods 16)
Atomic number, isotopes and isobars, Thomson's model and its limitations,
Rutherford's model and its limitation, Bohr's model and its limitations, concept of shells and subshells,
dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle,
concept of orbitals, quantum numbers, shape of s,p and d orbitals, rules for filling electrons in orbitals – Aufbau principle,
Pauli’s exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

Unit III: Classification of Elements and Periodicity in Properties (Periods 8)
Significance of classification, brief history of the development of periodic table,
modern periodic law and the present form of periodic table, periodic trends in properties of elements – atomic radii, ionic radii, Ionization enthalpy, electron gain enthalpy, electronegativity, valence.
Unit IV: Chemical Bonding and Molecular structure  (Periods 16)
Valence electrons, ionic bond, covalent bond: bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s,p and d orbital and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

Unit V: States of Matter: Gases and Liquids  (Periods 14)
Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation. Deviation from ideal behaviour.
Liquid State- vapour pressure, viscosity and surface tension (qualitative idea only)

Unit VI: Thermodynamics  (Periods 16)
System and types of system, surrounding, work, heat, energy, extensive and intensive properties, state functions.
First law of thermodynamics -internal energy and enthalpy, heat capacity and specific heat, measurement of \( ?U \) and \( ?H \), Hess's law of constant heat summation, enthalpies of bond dissociation, combustion, formation atomization, sublimation, phase transformation, ionization and solution.
Introduction of entropy as a state function, free energy change for spontaneous and non -spontaneous process criteria for equilibrium.

Unit VII: Equilibrium  (Period 16)
Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium - Le Chatelier's principle, ionic equilibrium - ionization of acids and bases, strong and weak electrolytes, degree of ionization, concept of \( \text{pH} \), hydrolysis of salts (elementary idea), buffer solution, solubility product, common ion effect (with illustrative examples).

Unit VIII: Redox Reactions  (Period 6)
Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, application of redox reactions.

Unit IX: Hydrogen  (Period 8)
Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen, physical and chemical properties of water, heavy water, hydrogen peroxide - preparation, properties and structure, hydrogen as a fuel.

Unit X: s -Block Elements (alkali and Alkaline Earth Metals)  (Periods 12)
Group 1 and Group 2 Elements
General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens, uses.
Preparation and Properties of Some Important Compounds:
Sodium carbonate, sodium chloride, sodium hydroxide and Sodium hydrogen carbonate, biological importance of sodium and potassium.
Calcium oxide and Calcium carbonate and industrial uses of lime and limestone, biological importance of Magnesium and Calcium.

Unit XI: Some p -Block Elements
General Introduction to p -Block Elements

Group 13 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group. Boron - physical and chemical properties, some important compounds, boron hydrides. Aluminium: Reactions with acids and alkalies, uses.

Group 14 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements of the group. Carbon - catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides. Important compounds of silicon and their uses: silicates and zeolites, their uses.

Unit XII: Organic Chemistry - Some Basic Principles and Technique

Unit XIII: Hydrocarbons
Classification of Hydrocarbons
Aliphatic hydrocarbons:
Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.
Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markonikov's addition and peroxide effect), ozonolysis, mechanism of electrophilic addition.
Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction with - hydrogen, halogens, hydrogen halides and water.

Unit XIV: Environmental Chemistry
Environmental pollution - air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutions, acid rain, ozone and its reactions, effects of depletion of ozone layer and its effect, greenhouse effect and global warming- pollution due to industrial wastes, green chemistry as an alternative tool for reducing pollution, strategies for control of environment pollution.

**Practicals**

<table>
<thead>
<tr>
<th>Evaluation Scheme for Examination</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Volumetric Analysis</td>
<td>10</td>
</tr>
<tr>
<td>Salt Analysis</td>
<td>8</td>
</tr>
<tr>
<td>Content Based Experiment</td>
<td>6</td>
</tr>
<tr>
<td>Class Record and Viva</td>
<td>6</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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• Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.
• Preparation of standard solution of sodium carbonate.
• Determination of strength of a given solution of hydrochloric acid by titrating it against standard sodium carbonate solution.

G. Qualitative Analysis (Periods 16)

Determination of one anion and one cation in a given salt

Cations -
Pb₂⁺, Cu₂⁺, As₃⁺, Al₃⁺, Fe₃⁺, Mn₂⁺, Ni₂⁺, Zn₂⁺, Co₂⁺, Ca₂⁺, Sr₂⁺, Ba₂⁺, Mg₂⁺, NH₄⁺

Anions – Co₃²⁻, S²⁻, SO₄²⁻, NO₂⁻, NO₃⁻, Cl⁻, Br⁻, I⁻, PO₄³⁻, C₂O₄²⁻, CH₃COO⁻

(Note: Insoluble salts excluded)

H. Extra Elements - nitrogen, sulphur, chlorine, bromine and iodine in an organic compound. (Periods 10)

PROJECT

Scientific investigations involving laboratory testing and collecting information from other sources.
A Few suggested Projects
• Checking the bacterial contamination in drinking water by testing sulphide ion.
• Study of the methods of purification of water.
• Testing the hardness, presence of iron, fluoride, chloride etc. Depending upon the regional variation in drinking water and study of causes of presences of these ions above permissible limit (if any).
• Investigation of the foaming capacity of different washing soaps and the effect of addition of sodium carbonate on it.
• Study the acidity of different samples of tea leaves.
• Determination of the rate of evaporation of different liquids.
• Study the effect of acids and bases on the tensile strength of fibers.
• Study of acidity of fruit and vegetable juices.

Note: Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

Recommended Textbooks.
1. Chemistry Part -I, Published by NCERT, 2006
2. Chemistry Part -II, Published by NCERT, 2006