CBSE CLASS XII
CHEMISTRY (Code No. 043

Rationale

Higher Secondary is the most crucial stage of school education because at this juncture specialized discipline based, content -oriented courses are introduced. Students reach this stage after 10 years of general education and opt for Chemistry with a purpose of pursuing their career in basic sciences or professional courses like medicine, engineering, technology and study courses in applied areas of science and technology at tertiary level. Therefore, there is a need to provide learners with sufficient conceptual background ofChemistry, which will make them competent to meet the challenges of academic and professional courses after the senior secondary stage.

The new and updated curriculum is based on disciplinary approach with rigour and depth taking care that the syllabus is not heavy and at the same time it is comparable to the international level. The knowledge related to the subject of Chemistry has undergone tremendous changes during the past one decade. Many new areas like synthetic materials, bio -molecules, natural resources, industrial chemistry are coming in a big way and deserve to be an integral part of chemistry syllabus at senior secondary stage. At international level, new formulations and nomenclature of elements and compounds, symbols and units of physical quantities floated by scientific bodies like IUPAC and CGPM are of immense importance and need to be incorporated in the updated syllabus. The revised syllabus takes care of all these aspects. Greater emphasis has been laid on use of new nomenclature, symbols and formulations,teaching of fundamental concepts,application of concepts in chemistry to industry/ technology, logical sequencing of units, removal of obsolete content and repetition, etc.

Objectives

The broad objectives of teaching Chemistry at Senior Secondary Stage are:

- to promote understanding of basic facts and concepts in chemistry while retaining the excitement of Chemistry
- to make students capable of studying chemistry in academic and professional courses

(such as medicine, engineering, technology) at tertiary level.

- to expose the students to various emerging new areas of chemistry and apprise them with the irrelevance in future studies and their application in various spheres of chemical sciences and technology.
- to equip students to face various challenges related to health, nutrition, environment, population,weather, industries and agriculture.
- to develop problem solving skills in students.
- to expose the students to different processes used in industries and their technological applications.
- to apprise students with interface of chemistry with other disciplines of science such as physics, biology, geology, engineering etc.
- to acquaint students with different aspects of chemistry used in daily life.

to develop an interest in students to study chemistry as a discipline.

CLASS XII (2017-18)
(THEORY)

Total Periods (Theory 160 + Practical 60)

Time: 3 Hours (70 Marks)

Unit No.	Title	No. of Periods	Marks
Unit I	Solid state	10	23
Unit II	Solutions	10	
Unit III	Electro chemistry	12	
Unit IV	Chemical Kinetics	10	
Unit V	Surface Chemistry	08	
Unit VI	General Principles and Processes of Isolation of Elements	08	

Unit VII	p-Block Elements	12	19
Unit VIII	d-and f- Block Elements	12	
Unit IX	Coordination Compounds	12	
Unit X	Haloalkanes and Haloarenes	10	28
Unit XI	Alcohols, Phenols and Ethers	10	
Unit XII	Aldehydes, Ketones and Carboxylic Acids	10	
Unit XIII	Organic Compounds containing Nitrogen	10	
Unit XIV	Biomolecules	12	
Unit XV	Polymers	08	
Unit XVI	Chemistry in Everyday life	06	
	TOTAL	**160**	**70**

Unit I: Solid State (10 Periods)

Classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea). Unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties.

Band theory of metals, conductors, semiconductors and insulators and *n* and *p* type semiconductors.

Unit II: Solutions (10 Periods)

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of

gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Van't Hoff factor.

Unit III: Electro chemistry (12 Periods)

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea), dry cell-electrolytic cells and Galvanic cells, lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a cell, fuel cells, corrosion.

Unit IV: Chemical Kinetics (10 Periods)

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant,integrated rate equations and half life (only for zero and first order reactions), concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenious equation.

Unit V: Surface Chemistry (08 Periods)

Adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids, catalysis, homogenous and heterogenous activity and selectivity; enzyme catalysis colloidal state distinction between true solutions, colloids and suspension; lyophilic, lyophobic multi-molecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation, emulsion - types of emulsions.

Unit VI: General Principles and Processes of Isolation of Elements (08 Periods)

Principles and methods of extraction - concentration, oxidation, reduction - electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron.

Unit VII: "p"-Block Elements (12 Periods)

Group -15 Elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; Nitrogen preparation properties and uses; compounds of Nitrogen, preparation and properties of Ammonia and Nitric Acid, Oxides of Nitrogen(Structure only) ; Phosphorus - allotropic forms, compounds of Phosphorus: Preparation and Properties of Phosphine, Halides and Oxoacids (elementary idea only).

Group 16 Elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, dioxygen: Preparation, Properties and uses, classification of Oxides, Ozone, Sulphur -allotropic forms; compounds of Sulphur: Preparation Properties and uses of Sulphur-dioxide, Sulphuric Acid: industrial process of manufacture, properties and uses; Oxoacids of Sulphur (Structures only).

Group 17 Elements: General introduction, electronic configuration, oxidation states, occurrence, 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).

Group 18 Elements: General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.

Unit VIII: "d" and "f" Block Elements (12 Periods)

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals - metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation, preparation and properties of $K_2Cr_2O_7$ and$KMnO_4$.

Lanthanoids - Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

Actinoids - Electronic configuration, oxidation states and comparison with lanthanoids.

Unit IX: Coordination Compounds (12 Periods)

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic propertiesand shapes, IUPAC nomenclature of mono nuclear coordination compounds.

Bonding, Werner's theory, VBT, and CFT; structure and stereoisomerism, importance of coordination compounds (in qualitative inclusion, extraction of metals and biological system).

Unit X: Haloalkanes and Haloarenes. (10 Periods)

Haloalkanes: Nomenclature, nature of C–X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

Haloarenes: Nature of C–X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only).

Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit XI: Alcohols, Phenols and Ethers (10 Periods)

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophillic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

Unit XII: Aldehydes, Ketones and Carboxylic Acids (10 Periods)

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes: uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit XIII: Organic compounds containing Nitrogen (10 Periods)

Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Cyanides and Isocyanides - will be mentioned at relevant places in text.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Unit XIV: Biomolecules (12 Periods)

Carbohydrates - Classification (aldoses and ketoses), monosaccahrides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); Importance of carbohydrates.

Proteins -Elementary idea of - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes. Hormones - Elementary idea excluding structure.

Vitamins - Classification and functions.

Nucleic Acids: DNA and RNA.

Unit XV: Polymers (08 Periods)

Classification - natural and synthetic, methods of polymerization (addition and condensation), copolymerization, some important polymers: natural and synthetic like polythene, nylon polyesters, bakelite, rubber. Biodegradable and non-biodegradable polymers.

Unit XVI: Chemistry in Everyday life (06 Periods)

Chemicals in medicines - analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

Chemicals in food - preservatives, artificial sweetening agents, elementary idea of antioxidants.

Cleansing agents- soaps and detergents, cleansing action.

PRACTICALS

Evaluation Scheme For Examination	Marks

Volumetric Analysis	08
Salt Analysis	08
Content Based Experiment	06
Project Work	04
Class Record and Viva	04
TOTAL	**30**

PRACTICALS SYLLABUS (60 Periods)

Micro-chemical methods are available for several of the practical experiments.

Wherever possible, such techniques should be used.

A. Surface Chemistry

(a) Preparation of one lyophilic and one lyophobic sol

Lyophilic sol - starch, egg albumin and gum

Lyophobic sol - aluminium hydroxide, ferric hydroxide, arsenous sulphide.

(b) Dialysis of sol-prepared in (a) above.

(c) Study of the role of emulsifying agents in stabilizing the emulsion of different oils.

B. Chemical Kinetics

(a) Effect of concentration and temperature on the rate of reaction between Sodium Thiosulphate and Hydrochloric acid.

(b) Study of reaction rates of any one of the following:

(i) Reaction of Iodide ion with Hydrogen Peroxide at room temperature using different concentration of Iodide ions.

(ii) Reaction between Potassium Iodate, ($Kl0_3$) and Sodium Sulphite: (Na_2SO_3) using starch solution as indicator (clock reaction).

C. Thermochemistry

Any one of the following experiments

i) Enthalpy of dissolution of Copper Sulphate or Potassium Nitrate.

ii) Enthalpy of neutralization of strong acid (HCI) and strong base (NaOH).

iii) Determination of enthaply change during interaction (Hydrogen bond formation)

between Acetone and Chloroform.

D. Electrochemistry

Variation of cell potential in $Zn/Zn^{2+}||Cu^{2+}/Cu$ with change in concentration of electrolytes (CuSO4 or ZnSO4) at room temperature.

E. Chromatography

i) Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of Rf values.
ii) Separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in Rf values to be provided).

F. Preparation of Inorganic Compounds

i) Preparation of double salt of Ferrous Ammonium Sulphate or Potash Alum.
ii) Preparation of Potassium Ferric Oxalate.

G. Preparation of Organic Compounds

Preparation of any one of the following compounds
i) Acetanilide
ii) Di -benzal Acetone
iii) p-Nitroacetanilide
iv) Aniline yellow or 2 - Naphthol Aniline dye.

H. Tests for the functional groups present in organic compounds:

Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (Primary) groups.

I. Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in givenfood stuffs.

J. Determination of concentration/ molarity of $KMnO_4$ solution by titrating it against a standard solution of:
i) Oxalic acid,

ii) Ferrous Ammonium Sulphate
(Students will be required to prepare standard solutions by weighing themselves).

K. Qualitative analysis
Determination of one cation and one anion in a given salt.

Cation -
Pb^{2+}, $Cu^{2+}As^{3+}$, $A\ell^{3+}$, Fe^{3+}, Mn^{2+}, Zn^{2+}, Cu^{2+}, Co^{2+}, Ni^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2-}

Anions -
CO_3^{2-}, S^{2-}, SO_3^{2-}, SO_4^{2-}, NO_2^-, Cl^-, Br^-, I^-, PO_4^{3-}, $C_2O_4^{2-}$, CH_4COO^-

(**Note:** Insoluble salts excluded)

PROJECT

Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects.

- Study of the presence of oxalate ions in guava fruit at different stages of ripening.
- Study of quantity of casein present in different samples of milk.
- Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.
- Study of the effect of Potassium Bisulphate as food preservative under various conditions (temperature, concentration, time, etc.)
- Study of digestion of starch by salivary amylase and effect of pH and temperature on it.
- Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice, etc.
- Extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom).
- Study of common food adulterants in fat, oil, butter, sugar, turmeric power, chilli powder and pepper.

Note: Any other investigatory project, which involves about 10 periods of work, can be

chosen with the approval of the teacher.

Practical Examination for Visually Impaired Students of Classes XI and XII

Evaluation Scheme

Time Allowed: Two hours (Max. Marks: 30)

Identification/Familiarity with the apparatus	5 marks
Written test (based on given/prescribed practicals)	10 marks
Practical Record	5 marks
Viva	10 marks
TOTAL	**30 marks**

General Guidelines

- The practical examination will be of two hour duration.
- A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question papers should be related to the listed practicals. Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required,simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory/principle/concept,

apparatus/materials/ chemicals required, procedure, precautions, sources of error etc.

A. Items for Identification/Familiarity of the apparatus for assessment in practicals(All experiments)

Beaker, glass rod, tripod stand, wire gauze, Bunsen burner, Whatman filter paper, gas jar, capillary tube, Pestle and mortar, Test tubes, tongs, test tube holder, test tube stand, burette, Pipette, conical flask, standard flask, clamp stand, Tripod stand, burner, wire gauze, funnel, filter paper Hands-on Assessment

- Identification/familiarity with the apparatus
- Odour detection in qualitative analysis

B. List of Practicals

The experiments have been divided into two sections: Section A and Section B. The experiments mentioned in Section B are mandatory.

SECTION- A

A Surface Chemistry

(1) Preparation of one lyophilic and one lyophobic sol

Lyophilic sol - starch, egg albumin and gum

(2) Preparation of one lyophobic sol

Lyophobic sol - Ferric hydroxide

B Chromatography

(1) Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of Rf values (distance values may be provided).

C Tests for the functional groups present in organic compounds:

(1) Alcoholic and Carboxylic groups.

(2) Aldehydic and Ketonic

D Characteristic tests of carbohydrates and proteins in the given food stuffs.

E Preparation of Inorganic Compounds- Potash Alum

SECTION-B (Mandatory)

F Quantitative analysis

(1) (a) Preparation of the standard solution of Oxalic acid of a given volume

(b) Determination of molarity of KMnO4 solution by titrating it against a standard solution of Oxalic acid.

(2) The above exercise [F 8 (a) and (b)] to be conducted using Ferrous ammonium sulphate (Mohr salt)

G Qualitative analysis:

(1) Determination of one cation and one anion in a given salt.

Cation - NH_4^+

Anions – CO_3^{2-}, S^{2-}, SO_3^{2-}, Cl^-, CH_3COO^-

(Note: Insoluble salts excluded)

Note: The above practicals may be carried out in an experiential manner rather than recording observations.

Prescribed Books:

1. Chemistry Part -I, Class-XII, Published by NCERT.
2. Chemistry Part -II, Class-XII, Published by NCERT.

CHEMISTRY (Code No. 043)
QUESTION PAPER DESIGN
CLASS - XII (2017-18)

Time 3 Hours (Max. Marks: 70)

Typology of Questions:

1. Remembering- (Knowledge based Simple recall questions, to know specific facts, terms, concepts, principles, or theories, Identify, define,or recite, information)

Very Short Answer (VSA) (1 mark): 2

Short Answer-I (SA-I) (2 marks): 1

Short Answer –II (SA-II) (3 marks): 1

Value based question (4 marks): 0

Long Answer (LA) (5 marks): 0

Total Marks: 7
% Weightage: 10%

2. **Understanding- Comprehension -**to befamiliar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase information)

Very Short Answer (VSA) (1 mark): 0
Short Answer-I (SA-I) (2 marks): 2
Short Answer –II (SA-II) (3 marks): 4
Value based question (4 marks): 0
Long Answer (LA) (5 marks): 1
Total Marks: 21
% Weightage: 30%

3. **Application** (Use abstract information in concrete situation, to apply knowledge to new situations, Use given content to interpret a situation, provide an example, or solve a problem)

Very Short Answer (VSA) (1 mark): 0
Short Answer-I (SA-I) (2 marks): 2
Short Answer –II (SA-II) (3 marks): 4
Value based question (4 marks): 0
Long Answer (LA) (5 marks): 1
Total Marks: 21
% Weightage: 30%

4. **High Order Thinking Skills (Analysis & Synthesis-** Classify, compare, contrast,or differentiate between different pieces of information, Organize and/or integrate unique pieces of information from a variety of sources)

Very Short Answer (VSA) (1 mark): 2
Short Answer-I (SA-I) (2 marks): 0
Short Answer –II (SA-II) (3 marks): 1
Value based question (4 marks): 0
Long Answer (LA) (5 marks): 1

Total Marks: 10
% Weightage: 14%

5. **Evaluation-** (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)

Very Short Answer (VSA) (1 mark): 1
Short Answer-I (SA-I) (2 marks): 0
Short Answer –II (SA-II) (3 marks): 2
Value based question (4 marks): 1
Long Answer (LA) (5 marks): 0
Total Marks: 11
% Weightage: 16%

QUESTION WISE BREAK UP

Type of Question	Mark Per Question	Total no. of Questions	Total Marks
VSA	1	5	05
SA-1	2	5	10
SA-2	3	12	36
VBQ	4	1	04
LA	5	3	15
TOTAL		**26**	**70**

1. **Internal Choice:** ***There is no overall choice in the paper. However, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 5 marks weightage.***

2. The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.