Himachal Pradesh Board of School Education, Dharamshala

CHEMISTRY

10+1

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 of Chemistry , which will make them competent to meet the challenges of academic and professional courses after the higher 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 , applications 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 help the learners

- 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 technology) at tertiary level .
- To expose the students to various emerging new areas of chemistry and apprise them with their relevance in their future studies and their application in various spheres of chemical sciences and technology
- To equip students to face various changes 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 .

COURSE STRUCTURE
THEORY

One Paper **Time : 3 Hours** **60 Marks**

Unit No.	Title	Marks
Unit I	Some basic Concepts of Chemistry	3
Unit II	Structure of Atom	5
Unit III	Classification of Elements and Periodicity in Properties	3
Unit IV	Chemical Bonding and Molecular Structure	5
Unit V	States of Matter : Gases and Liquids	3
Unit VI	Thermodynamics	5
Unit VII	Equilibrium	6
Unit VIII	Redox Reactions	3
Unit IX	Hydrogen	3
Unit X	S - Block Elements	4
Unit XI	Some P - Block Elements	6
Unit XII	Organic Chemistry - some basic Principles and Techniques	5
Unit XIII	Hydrocarbons	7
Unit XIV	Environmental Chemistry	2
	Total	**60**

Unit 1 : Some Basic Concepts of Chemistry

General Introdcution 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

Discovery of electron . proton and neutron ; atomic number , isotopes and isobars . Thomson's model and its limitations Rutherford's model and its limitations Bohr's model and its limitations , concepts of shells and subshells , dual nature of matter and light , De Broglie's relationship . Heisenberg uncertainty principle , concept of orbitals , quantum numbers , shapes of s , p . and d orbitals , rules for filling electrons in orbitals - Aufuau principle , Pauli 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

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 , inert gas radii . lonization enthalpy , electron gain enthalpy , electro negativity , valence .

Unit IV : Chemical Bonding and Molecular Structure

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 orbitals and shapes of some simple molecules , molecular orbital : theory of homo nuclear diatomic molecules (qualitative idea only) , hydrogen bond .

Unit V : States of Matter : gases and liquids

Three states of matter . Intermolecular interactions , type 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 . Derivation from ideal behaviour , liquefaction of gases , critical temperature

Liquid State - Vapour pressure , viscosity and surface tension (qualitative idea only , no mathematical derivations)
Liquid State - Vapour pressure , viscosity and surface tension (qualitative idea only , no mathematical derivations) .

Unit VI : Thermodynamics

Concepts of System , types of systems , surroundings . Work , heat , energy , extensive and intensive properties , state fucntions .

First law of thermodynamics - internal energy and enthalpy , heat capacity and specific heat , measurement of AU and AH , Hess's law of constant heat summation enthalpy of bond dissociation combustion formation , atomization , sublimation Phase transition , ionization , and dilution .

Introduction of entropy as a state function , free energy change for spontaneous and non - spontaneous process , equilibrium Zeus

Unit VII : Equilibrium

Equilibrium in physical and chemical processes , dynamic nature of equilibrium , law of mass action , equilibrium constant , factors affecting equlibrium- Le Chatelier's principle ; ionic equilibrium - ionization of acids and bases , strong and weak electrolytes , degree of ionization , concept of pH . Hydrolysis of salts (elementary idea) . Buffer solutions solubility product , common ion effect (with illustrative examples)

Unit VIII : Redox Reactions

Concept of oxidation and reduction , redox reactions , oxidation number balancing redox reactions , applications of redox reactions

Unit IX : Hydrogen

Position of hydrogen in periodic table . occurrence , isotopes preparation , properties and uses of hydrogen ; hydrides - ionic , covalent and interstitial ; physical and chemical properties of water , heavy water , hydroen peroxide - preparation , reactions and structure ; hydrogen as a fuel .

Unit X : S - Block Elements (Alkali and Alkaline earth metals)
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

CaO , $CaCO_3$ and industrial use of lime and limestone , biological importance of Mg and Ca.

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 : borax , boric acids , boron hydrides . Aluminium uses , reactions with acids and alkalies .

Group 14 elements : General introduction , electronic configuration , occurrence , variation of properties , oxidation states , trends in chemical reactivity , anomalous behaviour of first element , Carbon - catenation , allotropic forms , physical and chemical properties , uses of some important compounds • oxides . Important compounds of silicon and a few uses : silicon tetrachloride , silicones , silicates and zeolites .

Unit XII : Organic Chemistry - Some Basic Principles and Techniques

General introduction method qualitative and quantitative analysis , classifiction and IUPAC nomenclature of organic compounds .

Electronic displacements in a covalent bond : inductive effect , electromeric effect , resonance and hyper conjugation .

Homolytic and heterolytic fission of a covalent bond : free radicals carbocations , carbanions , electrophiles and nucleophiles , types of organic reactions

Unit XIII : Hydrocarbons
Classification of Hydrocarbons

Alkanes - Nomenclature , isomerism , conformations (ethane only) , physical properties , chemical reactions including free radical mechanism on 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 (Markovníkov's addition and peroxide effect) . ozonolysis , oxidation , mechanism of electrophilic addition ,

Alkenes - Nomenclature , structure of triple bond (ethyne) . physical properties . Methods of preparation , chemical reactions : acidic character of alkynes , addition reaction of hydrogen , halogens , hydrogen halides and water .

Aromatic hydrocarbons : Introduction , IUPAC nomenclature , Benzene : resonance aromaticity , chemical properties : machanism of electrophilic substitution . - nitration sulphonation , halogenation . Friedel Craft's alkylation and acylation directive influence of functional group in mono - substituted benzene , carcinogenicity and toxicity .

Unit XIV : Environmental Chemistry

Environmental pollution - air , water and soil pollution , chemical reactions in atomosphere smog , major atmospherica pollutants ; acid rain , ozone and its reactions , effects of depletion of ozone layer , greenhouse effect and global warming - pollution due to industrial wastes : green chemistry as an alternative tool for reducing pollution , strategy for control of environmental pollution .

PRACTICALS

EVALUATION SCHEME FOR EXAMINATION	MARKS
➢ Volumetric Analysis	06 Marks
➢ Salt Analysis	05 Marks
➢ Content Based Experiment	03 Marks
➢ Class Record and Viva	03 Marks
➢ Investigatory Project	03 Marks
Total	**20 Marks**

PRACTICALS SYLLABUS

A. Basic Laboratory Techniques

(a) Cutting a glass tube and glass rod .
(b) Bending of a glass tube
(C) Draw out , a glass jet .
(d) Boring a Cork .

B. Characterization and Purification of chemical substance

1 . Determination of melting point of organic compound
2 . Determination of boiling point of organic compound
3 . Crystallization involving impure sample of anyone of the following Alum , copper sulphate , Benzoic acid .

C. Experiments related of pH change

(a) Anyone of the following experiments : Determination of pH of some solutions obtained from fruit juices , solutions of known and varied concentrations of acids . bases and salts using pH paper or universal indicator Comparing the pH of solutions of strong and weak acid of same concentration . Study the pH change in the titration of a strong base using universal indicator

(b) Study of pH change by common - ion effect in case of weak acids and weak bases .

D. Chemical equilibrium

One of the following experiments :

(a) Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing / decreasing the concentration of either ions .

(b) Study the shift in equilibrium between [Co (H20) 612+ and chloride ions by changing the concentration of either of the ions.

E. Quantitative estimation

- using a chemical balance .
- Preparation of standard solution of oxalic acid .
- 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 .

F. Qualitative analysis

Determination of one anion and one cation in a given salt

Cations - Pb^{2+} , Cu^{2+} , As^{3+}, Al^{3+}, Fe^{3+} Mn^{2+} , Zn^{2+} , Co^{2+} , Ca^{2+} Sr^{2+} , Ba^{2+} , Mg^{2+} NH^{4+}

Anions - CO_3^{2-} , S^{2-} , SO_3^{2-} . HO_2^{1-} , NO_3^{-1}, Cl^-, Br^- ,I^- PO_4^{3-} , $C_2O_4^{2}$, $CH_3\,COO^-$

(Note : Insoluble salts excluded)

(G) Detection of nitrogen , sulphur , Chlorine

Bromine and iodine in an organic compound

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 the 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 them .

Study of the acidity of different samples of the tea leaves

Determination of the rate of evaporation of different liquids

Study of the effect of acids and bases on the tensile strength of fibers . Analysis of fruit and vegetable juices for their acidity

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

Himachal Pradesh Board of School Education, Dharamshala

Subject Chemistry(Theory) **Session 2022-23**

Class :XI (Regular)

Time: 3 Hours Max. Marks = 60

Unit wise distribution of marks

Sr. No.	Unit No.	Name of Unit	Total Marks
1	Unit-1	Some basic Concepts of Chemistry	03
2	Unit-2	Structure of Atom	05
3	Unit-3	Classification of Elements and Periodicity in Properties	03
4	Unit-4	Chemical Bonding and Molecular Structure	05
5	Unit-5	States of Matter : Gases and Liquids	03
6	Unit-6	Thermodynamics	05
7	Unit-7	Equilibrium	06
8	Unit-8	Redox Reactions	03
9	Unit-9	Hydrogen	03
10	Unit-10	S - Block Elements	04
11	Unit-11	Some P - Block Elements	06
12	Unit-12	Organic Chemistry - some basic Principles and Techniques	05
13	Unit-13	Hydrocarbons	07
14	Unit-14	Environmental Chemistry	02
		Total	**60**

Chemistry(Theory) = 60 Marks
Practical = 20 Marks
Internal Assessment = 20 Marks

TOTAL = 100 Marks

HP BOARD OF SCHOOL EDUCATION DHARAMSALA
Annual (Theory) Class: XI (Regular)
Subject Chemistry Session 2022-23

Time: 3 Hours **Design of Question Paper** *Max. Marks=60*

(Blue Print)

Total No. of Questions: 30

a) **Section A Q.1 to Q. 12 MCQ (1 mark each)**
b) **Section B Q. 13 to Q. 21 short answer type (2 marks each)**
c) **Section C Q.22 to Q. 27 subjective type (3 marks each)**
d) **Section D Q. 28 to Q. 30 carry (4 marks each)**

Sr. No.	Unit No.	Name of Unit	1-Mark question MCQ	2-Marks questions	3-Marks questions	4- Marks question	Total
1	Unit-1	Some basic Concepts of Chemistry	**1**	**1**	**-**	**-**	**03**
2	Unit-2	Structure of Atom	**1**	**2**	**-**	**-**	**05**
3	Unit-3	Classification of Elements and Periodicity in Properties	**1**	**1**	**-**	**-**	**03**
4	Unit-4	Chemical Bonding and Molecular Structure	**2**	**-**	**1(Optional choice)**	**-**	**05**
5	Unit-5	States of Matter : Gases and Liquids	**1**	**1(Optional choice)**	**-**	**-**	**03**
6	Unit-6	Thermodynamics	**1**	**-**	**-**	**1**	**05**
7	Unit-7	Equilibrium	**1**	**1**	**1**	**-**	**06**
8	Unit-8	Redox Reactions	**0**	**-**	**1**	**-**	**03**
9	Unit-9	Hydrogen	**0**	**-**	**1**	**-**	**03**
10	Unit-10	S - Block Elements	**1**	**-**	**1**	**-**	**04**
11	Unit-11	Some P - Block Elements	**0**	**1**	**-**	**1 (Internal choice in questions)**	**06**
12	Unit-12	Organic Chemistry - some basic Principles and Techniques	**2**	**-**	**1**	**-**	**05**
13	Unit-13	Hydrocarbons	**1**	**1**	**-**	**1 (Optional choice)**	**07**
14	Unit-14	Environmental Chemistry	**-**	**1**	**-**	**-**	**02**
		Total questions	**12**	**09**	**06**	**03**	
		Total marks	**1x12=12**	**2x9=18**	**3x6=18**	**4x3=12**	**60**

Annual (Theory) *Class: XI (Regular)*
Subject Chemistry *Session 2022-23*
Time: 3 Hours *Max. Marks=60*

Blue Print of MCQ

Sr. No.	Types of questions	No. of questions
1	Concept based /direct	3
2	Numerical based	2
3	Match the columns/skill based	1
4	Case study / comprehensions	1
5	Assertion and Reasoning	2
6	Diagram / Graph / Interpretation	1
7	Miscellaneous (Understanding and Knowledge based)	2
	Total number of questions	**12**

Prescribed Book

Chemistry Published by HPBOSE Dharamshala