RKUNIVERSITY

SYLLABUS

Course Title	Chemistry	
Course Code	BSC101	
Course Credit	Lecture : 5	
	Practical : 3	
	Total : 8	

Course Objectives

On the completion of the course, students will be able to:

- Understand the fundamental of chemistry.

Detailed Syllabus

Sr. No.	Name of Chapter & Details	Hours Allotted
	SECTION-I	
Unit-1	**Inorganic Chemistry** **1.1 Periodic Properties** - Explanation and general trends of the following periodic properties ▪ Atomic and ionic radii ▪ Ionization Potential ▪ Electronegativity ▪ Electron affinity - Pauli's method for the determination of ionic radius of isoelectric ions and problems based on it **1.2 Bonding and Shapes of Molecules** - Valance bond theory and its limitations	**20**

- **Hybridization - concept of hybridization**
    - sp {C_2H_2, $BeCl_2$}
    - sp^2 {BF_3, C_2H_4}
    - sp^3 {CH_4}
    - sp^3d {PCl_5}
    - sp^3d^2 {SF_6}
- **Stereochemisry of inorganic molecules**
    - Sidgwick powell rule
    - VSEPR Theory

1.3 Elements of the first transition series

- Introduction and definition
- Electronic configuration
- Reversal of energies of 3rd and 4s orbitals
- **Physical properties**
    - Metallic
    - Crystal structure
    - Conductivity
    - Density
    - Catalytic properties
    - Tendency of formation of alloys
- **Atomic properties**
    - Atomic and ionic radii
    - Ionisation potential
    - Oxidation states and their stability
- **Magnatic properties**
    - Spectral properties

	▪ Nonstoichiometric ▪ Interstinal Compounds.	
Unit-2	**Organic Chemistry** **2.1 Substitution and Elimination reactions of Alkylhalides** - Introduction to types of reactions - Definition of substitution and elimination reactions - S_N1 reaction mechanism - S_N2 reaction mechanism - **Substitution reactions of alkylhalide : Reaction with** ▪ Aqueous KOH or moist Ag_2O ▪ Alkoxides or dry Ag_2O ▪ Na_2S or K_2S ▪ NaSH or KSH ▪ Alcoholic KCN ▪ Alcoholic NH_3 ▪ KNO2 or $AgNO_2$ - E^1 reaction mechanism - E^2 reaction mechanism - **Elimination reaction of alkylhalid**e ▪ Reaction with alcoholic KOH ▪ Action of heat **2.2 Cycloalkanes** - IUPAC Nomenclature of cycloalkanes : monocyclic, bicyclic and tricyclic systems - **Method of preparation of small ring cycloalkanes :**	**20**

	▪ Fund's method ▪ Perkin Method ▪ Sabtier and Sanderson's Method ▪ Dieckmann's method - Physical properties of cycloalkanes - **Chemical properties of cycloalkanes** ▪ Substitution reactions ▪ Addition reactions - Baeyer's strain theory - Sacshe-Mohr concept of strainless rings - **Preperation of large ring cycloalkanes** ▪ Thorpe-Zingler's method ▪ Acyloin Condensation **SECTION-II**	
Unit-3	**Physical Chemistry** **3.1 Thermodynamic** - Definition of thermodynamic term : system, surroundings - Types of systems - Intensive and extensive properties - State and path function and their differential - Thermodynamic processes - Concept of heat and work - First law of thermodynamics : Statement & Mathematical form - Definition of internal energy and enthalpy	**20**

	- Calculation of w, q, ΔE & ΔH for the expansion of ideal gases under isothermal and adiabatic conditions for revisable process - Bond dissociation energy and its calculation from thermochemical data - Work obtained during adiabatic and isothermal change - Heat capacity : Heart capacities at constant volume and pressure and their relationship C_p-C_v = R - Joule's law-joule Thomson coefficient and inversion temperature (only definition) - Zeroth Law : mathematical treatment of zeroth law and its limitation and various statements of law **3.2 Adsorption** - Introduction - Types of adsorption - Freundlich adsorption isotherms and its limitations - Langmuir adsorption isotherms at high & low pressure and its limitations - Uses of adsorption	
Unit-4	**Analytical chemistry** **4.1 Modes of concentration [Concentration concept with numericals]** - **Preparation of standard solutions** ▪ Equivalent weight of acid and base ▪ Equivalent weight of acid salt ▪ Equivalent weight of an ion - Molarity with numerical - Normality with numerical	**15**

- Molality with numerical
- Strength of solutions
- % concentration w/v
- Volume fraction
- Weight fraction

4.2 Acids and Bases

- Derivation of hydrolysis constant (kh)
- Degree of hydrolysis (h)
- **pH of salt of**
    - Strong acid-weak base
    - Strong base-weak acid
    - Weak acid-weak base
- Buffers solution- Buffer capacity
- Mechanism of acidic and basic buffer solution
- Derivation of equation for pH of acidic and basic buffer solution
- Numericals-calculation of pH of buffer solutions

Laboratory course

CHEMISTRY PRACTICALS [C-102] SYLLABUS

A. Organic qualitative analysis [15 organic compounds]

Compounds containing one functional group such as phenolic, carboxylic acid, ester, amide, nitro, amine, aldehyde, ketone, alcohol, halogen, anilide, carbohydrate and hydrocarbon.

B. Volumetric analysis

1. To prepare solution of acids and bases with define concentration

2. To prepare a solution by dissolving 'x' gms $NaHCO_3$/ $Na2CO_3$ in 100 ml solution and determine its concentration in terms of normality and molarity using given 0.1 M HCl solution.

3. To determine the normality, molarity and gms/litre of NaOH and HCl using 0.05M Na_2CO_3 solution

4. To determine the molarity, g/litre and normality of each component in a given mixture of $NaHCO_3$ and Na_2CO_3 the using 0.1 M HCl solution

5. To determine the molarity, g/litre and normality of each component in a mixture of $H_2C_2O_4.2H_2O$ and H_2SO_4 using 0.02 M $KMnO_4$ and 0.1 M NaOH solution

6. To determine the molarity, g/litre and normality of each component in a mixture of $K_2C_2O_4.2H_2O$ and $K_2C_2O_4.H_2O$ using .1 M NaOH and 0.02 M $KMnO_4$ solution

7. To determine the molarity, g/litre and normality of $KMnO_4$ and $FeSO_4.7H_2O$ solution using 0.05M $H_2C_2O_4.2H_2O$ solution

8. To determine the normality, g/litre and normality of $FeSO_4(NH_4)2SO_4.6H_2O$ and $K_2Cr_2O_7$ solutions using 0.02 M $KMnO_4$ solution

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum ten experiments shall be there in the laboratory related to course contents.

Students Learning Outcomes:

At the end of the course the students will be able to:

- Know the basic concepts of Organic chemistry and Inorganic Chemistry
- Apply knowledge in Physical Chemistry and Analytical Chemistry

eference Books:

List of Reference Books Inorganic Chemistry

- Concise Inorganic Chemistry by J.D.Lee, ELBS
- Basic Inorganic Chemistry by – FA.Cotton and G. Wikinson
- Advanced Inorganic Chemistry (3rd Edition) - FA.Cotton and G. Wikinson, Wiley Eastern Pvt.Ltd
- Valance and Molecular Structure by Cartmell and Fowels
- Atomic Structure and Chemical Bonding by Manas Chanda
- Inorganic Chemistry by Suretker Thate
- Inorganic Chemistry – James E. Huheey (3rd Edition) harper International SI Edition

List of Reference books for Organic Chemistry

- Advanced Organic Chemistry by Arun Bahl and B.S.Bahl
- Text Book of Organic Chemistry for BSc students by B.S.Bahl
- Organic Chemistry by Morrison and Boyd
- Organic Chemistry by T.W. Graham Solomons and Craig B. Fryhle
- Organic Chemistry by Clayden
- Fundamentals of Organic Chemistry by Solomon, John Wileyxtbook of Organic Chemistry Reactions, Mechanism and Structure by Michael B Smith and Jerry March

List of Reference books for Physical Chemistry

- A Textbook of Physical Chemistry by P.L.Soni, O.P.Dharmarha and U.N. Dash
- Physical Chemistry by Dr. D.R.Pandit, A.R.Rao and Padke
- Progressive Physical Chemistry by Dr.Snehi, Merrut Publications
- Principles of Physical Chemistry by Samuel Glasstone
- Elements of Physical Chemistry by Saumel Glasstone and D lewis
- Introduction to Electrochemistry by S.Gladstone
- A text book of Physical Chemistry by B.K.Sharma
- Emf by B.K.Sharma

List of Reference Books for Physical Chemistry

- Fundamental of analytical chemistry by Skoog & West
- Instrumental Method & Chemical Analysis by B.K. Sharma
- Water Analysis and Water Pollution by V.P. Kudesia
- Instrumental Method & Chemical Analysis by Chatwal Anand
- Book for Water Analysis by R.K.Trivedi, V.P.Kudesia
- Analytical Chemistry by Dick
- Inorganic Qualitative Analysis by Vogel and Gehani Parekh
- Electrometric Methods of Analysis by Browning
- Principle of Instrumental Analysis by Skoog