

K.T.S.P. Mandal's
Sahebraoji Butte Patil Mahavidyalaya, Rajgurunagar
Department of Chemistry
Annual Teaching Plan
A.Y. 2019-20

Sr. No.	Class	Subject Name
1	F.Y.B.Sc	1.. Physical Chemistry 2. Organic Chemistry 3.Inorganic Chemistry 4.Analytical Chemistry 3. Practical Paper
2	S.Y.B.Sc.	1. Physical & Analytical Chemistry 2. Organic & Inorganic Chemistry 3. Practical Paper

K.T.S.P.MANDAL'S
Sahebraoji ButtePatil Mahavidyalaya,Rajgurunagar.
F.Y.B.Sc.Physical chemistry (Paper I)
Teaching Plan 2019-20 (SEM-I) No.Of Lectures per week-03
Name of Teacher: Prof.Kolhe M.P.

Month	Chapter	TopicName	No. of lectures
July-Aug 2019	Chemical Energetics	Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances, problems	11L
Aug-Sept 2019	Chemical Equilibrium	Introduction: Free Energy and equilibrium -Concept, Definition and significance The reaction Gibbs Energy, Exergonic and endergonic reaction. The perfect gas equilibrium, the general case of equilibrium, the relation between equilibrium constants, Molecular interpretation of equilibrium constant. The response of equilibria to conditions- response to pressure, response to temperature, Van't Hoff equation, Value of K at different temperature, Problems. Assignment No.1	11L

Sept- Oct 2019	Ionic Equilibria	<p>Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts– applications of solubility product principle.</p> <p>AssignmentNo.2</p> <p>LearningOutcome1.ChemicalEnergetics1.Studentswillbe</p>	14L
		<p>abletoapplythermodynamicprinciplestophysicalandchemical process.</p> <p>InternalExamination-1</p>	
Oct19		<p>Questionpaper Solving</p> <p>Questionpaper checking</p>	

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Department Of Chemistry

K.T.S.P.MANDAL'S
Sahebraoji ButtePatil Mahavidyalaya, Rajgurunagar.
Teaching Plan 2019-20 Sem.-I Class:F.Y.B.Sc.Chemistry,
Name of Paper: Organic Chemistry (Paper II)
No. of Lectures allotted per week:03
Name of Teacher:Prof. Kolhe M.P.

Month	Name of Chapter	Topic Covered	Lectures
July 19	Fundamentals of Organic Chemistry	Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule. Assignment-1	09L
Aug 19	Stereochemistry	Introduction, classification, Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Conformations with respect to ethane, butane and cyclohexane. Configuration: Geometrical - cis – trans, and E / Z Nomenclature (for upto two C=C systems). Optical isomerism Enantiomerism, Diastereomerism and Meso compounds). Concept of chirality (upto two carbon atoms). Threo and erythro; D and L; nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) Assignment-2	14L

Sep19	Aliphatic Hydrocarbons	<p>Functional group approach for the following reactions(preparations&reactions)tobestudied in context to their structure.</p> <p>Alkanes: (Up to 5 Carbons) Preparation: Catalytic hydrogenation,Wurtzreaction,Kolbe'ssynthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.</p>	(13L)
Oct19		<p>InternalExamination-1</p> <p>Alkenes:(Upto5Carbons)Preparation:Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) andtransalkenes(Birchreduction).Reactions:cis-addition (alk. KMnO4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.</p> <p>Assignment-3</p> <p>Alkynes:(Upto5 Carbons)Preparation:Acetylene from CaC2andconversion into higheralkynes;by dehalogenation of tetra halides and dehydrohalogenationofvicinaldihalideReactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation Learning Outcome 1. The students are expected to understand the fundamentals, principles, and recent development</p> <p>Assignment-4</p>	
Oct19		<p>Questionpaper Solving</p> <p>Questionpaper checking</p>	02L

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K.T.S.P.MANDAL'S
SAHEBRAOJI BUTTEPATIL MAHAVIDYALAYA, RAJGURUNAGAR
F.Y.B.SC.: Inorganic Chemistry (Paper I)
Teaching Plan 2019-20 (Sem-II)
NO. Of Lectures per week-03
Name of Lecturer –Prof. Kolhe M.P.

Month	Chapter	TopicName	No. of lecture
Nov19	Atomic Structure	<p>OriginofQuantumMechanics:Whystudyquantummechanics ?, Quantum mechanics arose out of interplay of experimentsand Theory Energy quantization- i) Black body radiation ii) The photoelectric effect iii) Wave particle duality-a) The particle character of electromagnetic radiation b) the wave character of particle, iv) diffraction by double slit v) atomic spectra, Review of-Bohr's theory and its limitations, Heisenberg Uncertainty principle. Quantum mechanics: Time independent Schrodinger equation and meaning of various terms in it, Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wave functions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radialdistribution functions andthe concept ofthe most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms. Shapesof s, p and d atomic orbitals, nodal planes. Discovery of spin,spin quantum number (s) and magnetic spin quantum number (ms).</p> <p>AssignmentNo.1</p>	14L

Dec19	Periodic table and Periodicity of Elements	Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations Long form of periodic table - s, p, d, and f block elements Detailed discussion of following properties of elements with reference to s and p block a) Effective nuclear charge, shielding or screening effect b) Atomic and ionic radii c) Crystal radii d) Covalent radii e) Ionization energies f) Electronegativity, Pauling's / electronegativity scale	09L
		Assignment No.2	
Jan20 Feb20	Chemical Bonding	Attainment of stable electronic configurations, Types of Chemical bonds: Ionic, covalent, coordinate and metallic bonds Ionic Bond: General characteristics of ionic bonding, Types of ions, Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character. Covalent bond: Valence Bond Approach, Hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. VSEPR theory, Assumptions, need of theory, application of theory to explain geometries of molecules such as i) ClF_3 ii) Cl_2O iii) BrF_5 iv) XeO_3 v) XeOF_4	
		Assignment No.3 Internal Examination	
Feb20 Mar20		Question paper solving Question paper checking	

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Sahebraoji Buttepatil Mahavidyalaya Rajgurunagar,
A.Y. 2019-20 Class: F. Y. B.Sc. Chemistry, Sem.-II Teaching Plan
Name of Paper: Analytical Chemistry (Paper II)
No. of Lectures allotted per week: 03
Name of Teacher: Prof. M. P. Kolhe

Month	Name of Chapter	Topic Covered	Lectures
Nov19	Introduction to Analytical Chemistry	What is Analytical Chemistry, the analytical perspectives, common analytical problems. Assignment- 1	03L
Dec19	Calculation used in Analytical Chemistry	Some Important units of Measurements: SI units, distinction between mass and weight ,mole, millimole and calculation, Significant figures. Assignment-2	10L
Jan19	Qualitative Analysis of Organic Compounds	Types of organic compounds, characteristic tests and classifications, reactions of different functional groups, analysis of binary mixtures. Analysis-Detection of nitrogen , sulphur, halogen and phosphorous by Lassaigne's test. Purification of organic compounds: Introduction, recrystallisation, distillation, sublimation. Assignment-3 Internal Examination-1	14L
Feb19	Chromatographic Techniques, Paper and Thinlayer Chromatography	Introduction to Chromatography, IUPAC definition of Chromatography-paper chromatography, Thin Layer Chromatography, Ion Exchange chromatography, Gel permeation Chromatography, affinity chromatography, Gas chromatography, Supercritical fluid chromatography, High Performance liquid chromatography, Capillary electrophoresis,	04L

		<p>Classification of Chromatographic methods according to development procedures.</p> <p>Thin Layer Chromatography : Theory and principles, outline of the method , surface adsorption and spot shape, Comparison Of TLC with other forms of chromatography, adsorbents, preparation of plates, application of samples, development.</p> <p>Paper chromatography : Origin, overview of technique, sample preparation, types of paper, solvents, equilibrium, development, sample application and detection, Identification, Quantitative methods , application of paper chromatography,</p> <p>Assignment-4</p>	
	PHmeter	Introduction,	04L
Feb19 Mar19		Questionpaper solving Questionpaperchecking	

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Sahebraoji ButtePatil Mahavidyalaya, Rajgurunagar.

Teaching Plan - 2019-20 Class: S. Y. B. Sc. Sem.-I

Name of Paper: Physical & Analytical Chemistry (Paper I)No.

of Lectures allotted per week: 04

Name of Teacher: Prof. Kolhe M.P.

Month	Chapter	TopicCovered	Lect.
July-19	Elementary chemical Kinetics	Introduction to chemical Kinetics, molecularity & Order of reaction, reaction rates,rate laws, rate constant & its significance.Integrated rate law expression & its characteristics –first order, second order(singlereactant,tworeactantinvolved),examples of 1 st &2 nd order reaction,pseudo molecular reactions,factors affecting rate of reaction,measurement of rate of reaction,numericals. AssignmentNo-1	10L
Aug-19	Photo-chemistry	Introduction,thermal reactions & photochemical reactions, law of photochemistry,quantum yield, measurementofquantumyield,typesofphotochemical reactions- photosynthesis, photolysis, photocatalysis, photosensitization,photo-physical processes- fluorescence,phosphorescence,quenching,chemiluminescence,numerical. Assignment No-2 AssignmentNo-2	10L
Sept-19	Distribution Law	NernstdistributionLaw,statement&thermodynamic proof of Nernst distribution Law, association & dissociation of solute in solvent, application of distribution Law,Numericals AssignmentNo-3 InternalTestNo-1	4L
July-19	Introduction to Analytical Chemistry	Introduction,chemical analysis,application of chemical analysis,sampling ,types of analysis, commontechniques,instrumentalmethods,other techniques,factorsaffectingonchoiceofmethod AssignmentNo-4	3L

Aug-19	Errors in Quantitative Analysis	Introduction, Error, accuracy, precision, methods of expressing accuracy & precision, classification of errors, significant figures & computation, distribution of random errors, mean & standard deviations, reliability of results, Numericals Assignment No-5	5L
Sept-19	Inorganic Qualitative Analysis	Basic principle, common ion effect, solubility, solubility product, preparation of original solution, classification of basic radicals in groups, separation of basic radicals, removal of interfering anions (phosphate & borate), detection of acidic radicals Assignment No-6	8L
Oct-19	Analysis of Organic Compounds (Qualitative & Quantitative)	(A) Qualitative: Types of organic compounds, characteristic tests & classifications, reaction of different functional groups, analysis of binary mixtures. (B) Quantitative: i) Analysis: estimation of C, H, (O) by combustion tube, detection of nitrogen, sulphur, halogen & phosphate by Lassigne's test. ii) Estimation of nitrogen by Duma's, Kjeldahl's method, estimation of halogen, Sulphur & phosphate by carious method. iii) Determination of empirical & molecular formula, Numerical problems. Assignment No-7	8L

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Teaching Plan 2019-20 Class: S.Y.B.Sc. Sem.-II

Name of Paper: Physical & Analytical Chemistry (Paper I)

No. of Lectures allotted per week: 04

Name of Teacher: Prof. Kolhe M.P.

Month	Chapter	Topic Coverd	Lectures
Nov-19	FreeEnergy and Equilibriu m	Physicalchemistry– Introduction, Helmholtz free energy, variation of Helmholtz free energy with volume and temperature, Helmholtz free change energy for chemical reaction, Gibb's free energy, Variation of Gibb's free energy with pressure and temperature, Gibb's free energy change for chemical reaction, Free energy change for physical transitions, Free energy change for an ideal gas; standard free energy change, Gibb's- Helmholtzequation, Properties and significance of Gibb's free change, Van't Hoff reaction isotherm, thermodynamic equilibrium constants, Relation between Kp and Kc for gaseous reactions, variation of equilibrium constant with temperature, Criteria for chemical equilibrium, Physicalequilibrium, Clapeyron equation, Clausius–Clapeyron equation, Application of Clausius–Clapeyron equation, numericals. Assignment No-1	12L
Dec-19	Solution of Liquids in Liquids	Types of solutions, Ideal solutions, Raoult's law, ideal and non ideal solutions, Henry's law, Application of Henry's law with example CS ₂ in acetone, problems based on Raoult's law and Henry's law, vapor pressure–composition diagram of ideal and non ideal solution, temperature composition diagram of miscible binary solutions, distillation from temperature–composition diagram, Azeotropes, Partially immiscible liquids	12L

		AssignmentNo-2	
Jan-20	Introduction to volumetric analysis	Analytical Chemistry Introduction, methods of expressing concentrations, primary & secondary standard solutions, Apparatus used & their calibration; burettes microburettes, volumetric pipettes, graduated pipettes, volumetric flask, methods of calibration, instrumental & non-instrumental analysis-principles & types	6L
Feb-20	Non Instrumental volumetric analysis	Indicators –theory of indicators, acid base indicators, mixed & universal indicators Acid –Base titrations: Strong acid- Strong base, Weak acid- Strong base, Weak acid-weak base titration, Displacement titrations, polybasic acid titration, (Discuss titration with respect to neutralization & equivalence point determination & limitations) Redox titrations: Principle of redox titration, detection of equivalence point using suitable indicators. Complexometric titrations: Principle, EDTA titrations, choice of indicators, Iodometry & Iodimetry; principle, detection of end point, difference between Iodometry & Iodimetry, Standardisation of sodium thiosulphate solution using potassium dichromate & iodine method, Applications-estimation of Cl_2 Internal Test	18L

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Teaching Plan -2019-20 Class: S.Y.B.Sc.Sem.-I

Name of Paper- Organic and Inorganic chemistry (Paper II)

No. of Lectures allotted per week-04

Name of teacher- Prof. Kolhe M.P.

Month	Chapter	Topic	L
July 2019	Stereoisom-erism	Introduction to optical isomerism: Chirality, optical activity and polarimetry, enantiomers, absolute configuration, R/S system nomenclature with wedge and Fischer representation of two chiral centres, erythro, threo, meso-diastereomers with R/S configuration. Stereoisomerism Baeyer's strain theory, heat of combustion, cycloalkanes, factors affecting the stability of conformation, Conformation of cyclohexane - equatorial and axial bonds, Monosubstituted cyclohexane stability with -CH ₃ and - C(CH ₃) ₃ substituents. Structures of geometrical isomers of dimethylcyclohexane only Assignment-1	12
Aug 2019	Organic reaction Mechanism	Introduction, types of reagents—electrophile, nucleophile and free radical. Types of organic reactions: Addition, Elimination (elimination and Hofmann elimination), substitution (aliphatic electrophilic and nucleophilic, aromatic electrophilic) and rearrangement. Mechanism: (i) Aldol condensation (ii) Markovnikov and anti-Markovnikov addition reaction (iii) Saytzeff and Hoffmann elimination (iv) S _N and S _N reactions (v) Hofmann rearrangement Assignment- 2	12
Aug 2019	General Principles of Metallurgy	Introduction, occurrence of metals, ores and minerals, types of ores, operations involved in metallurgy, crushing, comminution, various methods of concentration such as hand picking, gravity separation, magnetic separation. Froth flotation, Calcinations, Roasting etc. Reduction, various methods of reduction such as smelting, Aluminothermic process and	06

		electrolytic reduction, Refining of metals, various methods of refining such as poling, liquation, electrolytic and vapour phase refining (Van Arkel Process). Aims: To study principles and process of metallurgy Assignment-3	
Sept 2019	Metallurgy of Aluminium (Electrometallurgy):	Occurrence, Physiochemical principles, Extraction of Aluminium, Purification of bauxite by Baeyer's process, Electrolysis of alumina, application of aluminum and its alloys. Aims: To study metallurgy of Aluminium. Objectives: A student should be able - To know physico-chemical principles involved in electrometallurgy. To understand electrolysis of alumina and its refining. To explain the uses of Aluminum and its alloys. Internal Examination-1	04
Sept 2019	Metallurgy of Iron and Steel (Pyrometallurgy)	Occurrence, concentration, calcination, smelting physio-chemical principles, reactions in the blast furnace, wrought iron, manufacture of steel by Bessemer and L.D. process, its composition and applications.	08
Oct. 2019	Corrosion and Passivity	Definition of corrosion, Types of corrosion, Atmospheric, Immersed, Mechanism of electrochemical corrosion, Factors affecting corrosion - position of metal in E.C.S., purity effect of moisture, effect of oxygen, pH, physical state of metal, methods of protection of metal from corrosion - alloy formation, Passivity : Definition, Theories of passivity - (i) Oxide film theory (ii) Gaseous film theory (iii) Physical film theory, Valence theory, Catalytic theory, Allotropic theory, Electrochemical passivity. Assignment-4	06
Oct 19		Question paper solving Question paper checking	02

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SAHEBRAOJIBUTTEPATILMAHAVIDYALAYA,RAJGURUNAGAR
DEPARTMENT OF CHEMISTRY**

Teaching Plan 2019-2020

S.Y.B.Sc. Sem– II

Name of Paper- Organic and Inorganic chemistry(Paper II)

No.of Lectures allotted per week-04

Name of teacher-Prof. Kolhe M.P.

Month	Chapter	Topic	L
NOV 2019	Reagents in Organic Synthesis	Catalytic hydrogenation including liquid phase hydrogenation, Birch reduction, NaBH ₄ , LiAlH ₄ , Sn/HCl, Oxidation reagents: KMnO ₄ , K ₂ Cr ₂ O ₇ , Jones reagent, PCC, Per acids, OsO ₄	08
NOV, DEC 2019	Chemistry of heterocyclic compounds with one hetero atom.	Definition and classification of heterocyclic compounds, nomenclature and aromatic character. Synthesis of Pyrrole, Furan, Thiophene, Pyridine and their reactions: Nitration, Sulphonation, Acylation and Catalytic reduction. Structure and synthesis of quinoline and Isoquinoline. Assignment-1	06
DEC 2019 JAN 2020	Introduction of Bio-molecules	Carbohydrates: Definition, classification, reaction of monosaccharide (glucose)- oxidation, reduction, osazone and ester formation, isomerization, Killiani-Fischer synthesis and Ruff degradation, Configuration of D/L configuration of (+) Glucose, Fischer-Haworth and chair formulae, Brief account of disaccharides: Sucrose, cellobiose, maltose and lactose. Polysaccharides: Starch, cellulose and glycogen. Amino acids: Fischer projection, relative configuration, classification, structures and reactions of amino acids, Properties and chemical reactions with amino and carboxylic group. Proteins:	10

		Formation of Peptide linkage, α -helical conformation, β -pleated structure, primary, secondary, tertiary and quaternary structure of proteins. Assignment-2	
JAN 2020	Chemistry of d-block elements	Position of d-block in periodic table, electronic configuration, trends in properties of these elements w.r.t.(a) size of atoms & ions (b) reactivity (c) catalytic activity (d) oxidation state (e) complex formation ability (f) colour (g) magnetic properties (h)non-stoichiometry(i)density, melting&boilingpoints Internal Examination-1	06
FEB 2020	Organometallic Chemistry	Definition of Organometallic compounds and Organometallic chemistry, CO as a π -acid donor ligand, binary metal carbonyls, methods of synthesis; (a) Direct reaction (b) Reductive carbonylation (c) Photolysis and thermolysis. Molecular and electronic structures (18 electron rule) of metal carbonyls. Homogenous catalysis- Hydroformylation (Oxo Process) and Wacker Process.	06
FEB. 2020	Acids, Bases and Solvents	Definition of acids and bases, Arrhenius theory, Lowry-Bronsted theory, Lewis concept, Lux-Flood theory, strength of acids and bases, trends in the strength of hydracids and oxyacids, Properties of solvents, M.P-B.P range, dipole moment, dielectric constant, Lewis acid-base character and types of solvents Assignment-3	06
Mar. 2020	Chemical Toxicology	Toxic chemicals in the environment, Impact of toxic chemistry on enzymes. Biochemical effect of Arsenic, Cadmium, Lead, Mercury, Biological methylation.	06
Mar 2020		Question paper Solving Question paper checking	02

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SAHEBRAOJI BUTTEPTIL MAHAVIDYALAYA, RAJGURUNAGAR
DEPARTMENT OF CHEMISTRY (S.Y.B.Sc.)**

Teaching Plan Year 2019-20

Class: S. Y. B.Sc. Chemistry, Term: Ist and IInd

Name of Paper: Chemistry practical

No. of Lectures allotted per batch:04

Name Of theTeacher- Prof. Kolhe M.P.

Sr. No.	Date	Name of Practicals
1.	July	To determine critical solution temperature of phenol water system
2.	Aug	Determination of solubility of benzoic acid at different temperature and to determine ΔH of dissociation process.
3.	Aug	To study neutralization of acid (HCl) base (NaOH) and CH_3COOH by NaOH and H_2SO_4 by NaOH.
4.	Aug	To determine the rate constant (to study kinetics) of acid catalyzed ester hydrolysis.
5.	Aug	To determine the rate constant of base catalyzed ester hydrolysis.
6.	Sep	Inorganic Qualitative Analysis Mixture No. 1
7.	Sep	Mixture No. 2
8.	Sep	Mixture No. 3
9.	Sep	Mixture No. 4
10.	Dec	Mixture No. 5
11.	Dec	Organic qualitative analysis of Binary Mixtures Mixture No. 1
12.	Dec	Mixture No. 2
13.	Dec	Mixture No. 3
14.	Jan	Mixture No. 4
15.	Jan	Organic Preparation Phthalic anhydride to phthalamide
16.	Jan	Glucose to osazone
17.	Jan	Estimation of sodium carbonate content of washing soda
18.	Feb	a) Preparation of standard 0.05N oxalic acid solution and standardization of approx. 0.05N KMnO_4 solution. b) Determination of the strength of given H_2O_2 solution with standard 0.05N KMnO_4 solution.
19.	Feb	Estimation of Aspirin from a given tablet and find errors in quantitative analysis
20.	Feb	Iodometric estimation of copper
21.	Feb	Internal Examination

