ETHIRAJ COLLEGE FOR WOMEN

(AUTONOMOUS)

CHENNAI - 600 008

DEPARTMENT OF CHEMISTRY

Syllabus for

B.Sc. CHEMISTRY

2018 – 2019

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)
CHENNAI – 8

DEPARTMENT OF CHEMISTRY
BACHELOR OF SCIENCE IN CHEMISTRY
CBC SYSTEM

(SYLLABUS EFFECTIVE FROM THE ACADEMIC YEAR 2018 -2019)

Department of Chemistry is revising syllabus with effect from the academic year 2018-2019, under CBC system with Part –IV and Part-V as specified by the Government of Tamil Nadu. Part IV and Part V components will seek to build the capacity of the students and provide inputs for their social service and social analysis capabilities.

Every academic year is divided into two semester sessions. Each semester will have a minimum of 90 working days and each day will have 5 working hours.

Teaching is organized into a modular pattern of credit courses. Credit is related to the number of lecture, tutorial and practical hours (LTP) for a particular subject. It is also related to the number of hours a student spends learning a subject or carrying out an activity.

REGULATIONS

1. ELIGIBILITY FOR ADMISSION:

Candidates for admission to the first year of the Degree of Bachelor of Science in Chemistry course shall be required to have passed the Higher Secondary Examinations conducted by the Government of Tamilnadu or an Examination accepted as equivalent thereto by the Syndicate of the University of Madras with Chemistry, Mathematics and Physics as subjects.

2. ELIGIBILITY FOR THE AWARD OF DEGREE:

A candidate shall be eligible for the award of the Degree only if she has undergone the prescribed course of study for a period of not less than three academic years, passed the examinations of all the six semesters prescribed and earned a total of 140 credits including Part-V. Students may earn extra credit by doing Add on Courses.

3. COURSE OF STUDY:

The main subject of study for Bachelor Degree in Chemistry consists of the following.

Study Components	No. of courses	Credit per course	Total credits
PART- I Tamil / Other languages	2+2=4	3	12
PART- II English	2+2=4	3	12
PART- III Core subject : Theory Practicals Elective Allied subject: Theory Practicals	 10 5 3 2+2=4 1	 - - 5 10+8 2	 43 17 15 18 2
PART – IV 1. (a) Not studied Tamil upto XII Std. –shall take Tamil comprising of two courses (level 6th Std.) (b) Studied Tamil up to XII Std.- taken non –Tamil under Part – I shall take Advanced Tamil comprising of two courses. (c) Others who do not come under (a & b) can choose non-Major Elective comprising of two courses. 2. Soft Skills 3. Environmental studies 4. Value Education	1+1=2 4 1 1	2 3 2 2	4 12 2 2
PART - V Extension activities	1	1	1
TOTAL			**140**

4. PASSING MINIMUM:

A candidate shall be declared to have passed in each Theory/ Practical of the main subject of study wherever prescribed, if she secured NOT LESS THAN 40% of the marks prescribed for the end semester examination and also 40% in the sum of end semester examination and continuous assessment. There is no passing minimum for Continuous Assessment (CA).

PART I, II & III:

The maximum marks for CA is 40 and for End Semester examination is 60.
The aggregate mark for each paper is 100.

PART IV:

The maximum marks for the End Semester examination is 50 and the passing minimum is 40% and there is no continuous assessment.

5. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

Part I, II, III & IV
Successful candidates passing the examination and securing the marks

(i) 60 % and above and

(ii) 50 % and above but below 60 % in the aggregate shall be declared to have passed the examination in the FIRST CLASS and SECOND CLASS respectively.

All other successful candidates shall be declared to have passed the examination in the THIRD CLASS.

Candidates who pass all the examinations (Part I, II, III and IV) prescribed for the course in the FIRST APPEARANCE ITSELF ALONE are eligible for ranking.

B.Sc. CHEMISTRY

CHOICE BASED CREDIT SYSTEM (CBCS)

From 2018-2019 Batch

COURSE PROFILE

SEMESTER – I						
Course Code	**Course Title**	**Hours/ Week**	**Credits**	**Marks**		
				CA	**SE**	**Total**
Part-I	Tamil/Hindi/French/Sanskrit	5	3	40	60	100
Part-II	English	5	3	40	60	100
Part – III						
CH18/1C/GC1	Core 1-General Chemistry I	7	5	40	60	100
	*Core Practical 1–Volumetric Analysis	3	-	-	-	-
MA18/1A/AM1	Allied Mathematics-I	6	5	40	60	100
Part-IV						
UG18/1N/BTA UG18/1N/ATA CH18/1N/COS	1a/1b/1c (1a – Basic Tamil , 1b- Advanced Tamil , 1c-Non – Major Elective-Cosmetology)	2	2	-	50	50
	Soft Skill 1	2	3	-	50	50
Total		**30**	**21**			

SEMESTER – II						
Course Code	**Course Title**	**Hours/Week**	**Credits**	**Marks**		
				CA	**SE**	**Total**
Part-I	Tamil/Hindi/French/Sanskrit	5	3	40	60	100
Part-II	English	5	3	40	60	100
Part –III						
CH18/2C/GC2	Core 2-General Chemistry II	7	5	40	60	100
CH18/2C/PR1	*Core 3 Practical 1–Volumetric Analysis	3	4	40	60	100
MA18/2A/AM2	Allied Mathematics-II	6	5	40	60	100
Part-IV						
UG18/2N/BTA UG18/2N/ATA CH18/2N/DPT	1a/1b/1c (1a – Basic Tamil , 1b-Advanced Tamil , 1c-Non – Major Elective – Dyeing and Printing of Textiles)	2	2	-	50	50
UG18/2S/ECS	Soft Skill 2- English Language and Communication Skills II	2	3	-	50	50
Total		**30**	**25**			

SEMESTER - III						
Course Code	**Course Title**	**Hours/Week**	**Credits**	**Marks**		
				CA	**SE**	**Total**
Part –I	Tamil/Hindi/Sanskrit/French	5	3	40	60	100
Part-II	English	5	3	40	60	100
Part – III CH18/3C/OC1	Core 4- Organic Chemistry I	7	5	40	60	100
	*Core Practical 2-Inorganic Qualitative Analysis	3	-	-	-	-
PH18/3A/GP1	General Physics-I	4	4	40	60	100
PH18/4A/PPR	*Allied Physics Practicals	2	-	-	-	-
Part-IV UG18/3S/EVS	Environmental studies	2	2	-	50	50
	Soft Skill - 3	2	3	-	50	50
Total		**30**	**20**			

SEMESTER - IV						
Course Code	**Course Title**	**Hours/Week**	**Credits**	**Marks**		
				CA	**SE**	**Total**
Part-I	Tamil/Hindi/French/Sanskrit	5	3	40	60	100
Part-II	English	5	3	40	60	100
Part – III CH18/4C/IC1	Core 5-Inorganic Chemistry I	7	5	40	60	100
CH18/4C/PR2	*Core 6-Practical 2–Inorganic Qualitative Analysis	3	4	40	60	100
PH18/4A/GP2	General Physics-2	4	4	40	60	100
PH18/4A/PPR	*Allied Physics Practicals	2	2	40	60	100
Part IV UG18/4S/VED	Value Education	2	2	-	50	50
	Soft Skill -4	2	3	-	50	50
Total		**30**	**26**			

SEMESTER – V						
Course Code	**Course Title**	**Hours/Week**	**Credits**	**Marks**		
				CA	**SE**	**Total**
CH18/5C/PHY	Core 7- Physical Chemistry	4	4	40	60	100
CH18/5C/OC2	Core 8-Organic Chemistry II	4	4	40	60	100
CH18/5C/IC2	Core 9- Inorganic Chemistry II	4	4	40	60	100
CH18/5C/ANC	Core 10-Analytical Chemistry	4	4	40	60	100
CH18/5E/SPE	Elective 1 - Spectroscopy	5	5	40	60	100
	*Core Practical 3 – Organic Chemistry	3	-	-	-	-
	*Core Practical 4 – Gravimetric Analysis	3	-	-	-	-
	*Core Practical 5- Physical Chemistry	3	-	-	-	-
Total		**30**	**21**			

SEMESTER – VI						
Course Code	**Course Title**	**Hours/ Week**	**Credits**	**Marks**		
				CA	**SE**	**Total**
CH18/6C/APC	Core 11-Applied Chemistry	4	3	40	60	100
CH18/6C/PHA	Core 12-Pharmaceutical Chemistry	4	4	40	60	100
CH18/6E/CKE	Elective 2 – Chemical Kinetics and Electrochemistry	5	5	40	60	100
CH18/6E/MAC	Elective 3- Materials Chemistry	5	5	40	60	100
CH18/6C/PR3	*Core 13 – Practical 3-Organic Chemistry	4	3	40	60	100
CH18/6C/PR4	*Core 14 – Practical 4 - Gravimetric Analysis	4	3	40	60	100
CH18/6C/PR5	*Core 15-Practical 5 - Physical Chemistry	4	3	40	60	100
Total		30	26			
Credits at the end of 6 semesters			139			
Part V	NCC/NSS/Sports/CSS	-	1	-	-	-
	Total Credits		**140**			

*Practical Examinations are conducted at the end of Even Semester (II, IV and VI Semesters)

B.Sc. CHEMISTRY

(MAJOR and ALLIED)

(Syllabus effective from the Academic year 2018-2019)

OBJECTIVES OF THE COURSE :

(i) To provide the basic knowledge in Chemistry and to help students develop analytical skills and attitude.

(ii) To give the right platform for a future career in Pharmaceutical, Material chemistry and Applied Chemistry.

(iii) Non- Major Electives enable the students to be entrepreneurs.

PREAMBLE:

- Modification of course contents in few courses based on feedback from students and report given by Academic Audit panel members.
- Part IV-Two Non- Major Electives one in each semester for I year , Environmental studies in Semester – III and Value education in semester - IV
- Four Soft Skill Courses in semesters I, II, III & IV
- Practical Examinations are conducted once in an academic year ie., at the end of semester II, IV and VI

COURSE PROFILE:

Total Credits: 140

Semester:	**I**	**II**	**III**	**IV**	**V**	**VI**	**NSS/NCC/Sports**
Credit :	**21**	**25**	**20**	**26**	**21**	**26**	**1**

B.Sc Chemistry Major Credits
Total Credits – 75 (Core credits – 60 & Elective Credits – 15)

Sem	Course Code	Part III (CORE) Title of the course	L	T	P	Total Hrs/ Week	Credits	Exam Hrs	Marks		
									CA	SE	Total
I	CH18/1C/GC1	Core 1-General Chemistry -I	4	3	0	7	5	3	40	60	100
II	CH18/2C/GC2	Core 2- General Chemistry -II	4	3	0	7	5	3	40	60	100
	CH18/2C/PR1	*Core3- Practical 1-Volumetric Analysis				3	4	3	40	60	100
III	CH18/3C/OC1	Core 4 – Organic Chemistry I	4	3	0	7	5	3	40	60	100
IV	CH18/4C/IC1	Core 5- Inorganic Chemistry I	4	3	0	7	5	3	40	60	100
	CH18/4C/PR2	*Core 6-Practical 2–Inorganic Qualitative Analysis				3	4	3	40	60	100
V	CH18/5C/PHY	Core 7- Physical Chemistry	3	1	0	4	4	3	40	60	100
	CH18/5C/OC2	Core 8-Organic Chemistry II	3	1	0	4	4	3	40	60	100
	CH18/5C/IC2	Core 9- Inorganic Chemistry II	3	1	0	4	4	3	40	60	100
	CH18/5C/ANC	Core 10-Analytical Chemistry	3	1	0	4	4	3	40	60	100
	CH18/5E/SPE	Elective 1 -Spectroscopy	4	1	0	5	5	3	40	60	100
VI	CH18/6C/APC	Core 11-Applied Chemistry	3	1	0	4	3	3	40	60	100
	CH18/6C/PHA	Core 12-Pharmaceutical Chemistry	3	1	0	4	4	3	40	60	100
	CH18/6E/CKE	Elective 2 –Chemical Kinetics and Electrochemistry	4	1	0	5	5	3	40	60	100
	CH18/6E/MAC	Elective 3- Materials Chemistry	4	1	0	5	5	3	40	60	100
	CH18/6C/PR3	*Core 13 Practical 3 – Organic Chemistry				4	3	3	40	60	100
	CH18/6C/PR4	*Core 14 Practical 4 – Gravimetric Analysis				4	3	3	40	60	100
	CH18/6C/PR5	*Core 15 Practical 5- Physical Chemistry				4	3	3	40	60	100

*Practical Examinations are conducted at the end of Even Semester (II, IV and VI Semesters)

Practical examination for CH18/6C/PR3 & CH18/6C/PR4 will be conducted in the forenoon and afternoon of the same day.

L= Lecture hours, T=Tutorial hours, P=Practical hours

CA= Continuous Assessment marks, SE= End Semester marks

ALLIED CHEMISTRY: Credits: 20 [10 Credits for subjects offered by Department of Chemistry and 10 credits for subjects offered by other departments]

Sem	Course Code	PART III Title of the Course	L	T	P	Total Hrs/ Week	Credits	Exam Hrs	Marks		
									CA	SE	Total
1	CH18/1A/NGC	Allied Chemistry - General Chemistry	3	1	0	4	4	3	40	60	100
II	CH18/2A/NBC	Allied Chemistry -Bio Organic Chemistry	3	1	0	4	4	3	40	60	100
II	CH18/2A/PRA	Allied Chemistry Practical – Volumetric and Organic Analysis				2	2	3	40	60	100
III	CH18/3A/ZGC	Allied Chemistry - General Chemistry	3	1	0	4	4	3	40	60	100
IV	CH18/4A/ZBC	Allied Chemistry- Bio Organic Chemistry	3	1	0	4	4	3	40	60	100
IV	CH18/4A/PRA	Allied Chemistry Practical – Volumetric and Organic Analysis				2	2	3	40	60	100
III	CH18/3A/PGC	Allied Chemistry –General Chemistry- 1	3	1	0	4	4	3	40	60	100
IV	CH18/4A/PGC	Allied Chemistry- General Chemistry-2	3	1	0	4	4	3	40	60	100
IV	CH18/4A/PRA	Allied Chemistry Practical – Volumetric and Organic Analysis				2	2	3	40	60	100

NON – MAJOR ELECTIVE: Credits 4

Sem	Course Code	PART IV (Non – Major Elective)	L hr	T hr	P hr	Total Hrs/ Week	Credits	Exam Hrs	End Semester Marks Maximum
I	CH18/1N/ COS	Non – Major Elective -1 - Cosmetology	2	0	0	2	2	2	50
II	CH18/2N/ DPT	Non Major Elective -2 -Dyeing and Printing of textiles	2	0	0	2	2	2	50

EVALUATION PATTERN:

Theory: Continuous Assessment (CA)

Pattern for Continuous Assessment

			CA
Test I	2hrs.	50marks	10 marks
II	2hrs.	50marks	10
Quiz/ Assignment/ Semester/ Field visit			10
Participatory Learning			10
		Total	**40 marks**

Practical: Continuous Assessment

(a) One Test	-	10 marks
(b) Skill in practical	-	20 marks
(c) Record	-	10 marks
Total		**40 marks**

End Semester Examination questions are to be chosen from the question bank by the external Examiner and evaluated by both Internal and External Examiners. Duration of Examination is 3 and the maximum mark is 60.

Part IV – Non – Major Elective

- The end semester examination question papers are to be set and evaluated by internal examiner only.
- Duration of examination is 2 hours and the maximum mark is 50.
- No Continuous Assessment.

Rubrics for Continuous Assessment

Assignment: Appearance, contents, originality, presentation, schematic representation and diagram, bibliography.

Seminar: Organization, subject knowledge, visual aids, confidence level, presentation.

Participatory learning: Answering questions, clearing doubts, participation in discussion, attendance, communication and language.

End Semester Examination question papers are to be set by the External Examiners and evaluated by both Internal and External Examiners.

Duration of examination is 3 hours and Maximum mark is 100.

QUESTION PAPER PATTERN:

CORE , ALLIED and ELECTIVE (Major) Courses:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARK
Part A	Definition/Short answers	20
Part B	Understanding, Descriptions / Problems	40
Part C	Application / Analysis / Synthesis / Evaluation	40

Part A: All 10 questions to be answered each carrying 2 marks with 2 questions from each unit

[10Q x 2 = 20 MARKS]

Part B: All 5 questions to be answered [5Q x 8 = 40 marks] with an internal choice choosing one semester from each unit

Part C: 2 questions to be answered out of 4 questions covering all the 5 units with a maximum of 4 subdivisions (a,b,c,d) [2Q x 20 = 40 marks]

Template of the Question Paper Common to All Non Major Electives

Answer Any Ten Questions Out of Twelve Questions 10Q x 5=50

SEMESTER- I

Title of the Course: Core 1-General Chemistry-I

Teaching hours: 15 × 7 = 105 **Credits: 5**

Course Code: CH18/1C/GC1 **L T P 4 3 0**

Objectives:

1. To provide basic concepts of chemical bonding.
2. To study the basic theory related to qualitative and quantitative Analysis.
3. To study the basic concepts in organic chemistry to understand reaction mechanisms.
4. To provide the concepts and applications of thermodynamics.
5. To provide knowledge in thermochemistry, solutions and their behavior.

COURSE OUTLINE

UNIT I: **Chemical bonding**: ionic bond-Madelung energy-polarization of ions Fajan's rule-covalent bond-Wave mechanical Principles involved in treatment of valence bond and molecular orbital theories-Shapes of molecules. VSEPRT BeF_2, BF_3, PF_5, SF_6, IF_7, H_2O, NH_3, IF_5, XeF_2, XeF_4, XeF_6 and $XeOF_4$, Molecular orbital theory as applied to N_2,,F_2 ,O_2-Super oxo and peroxo ions, CO and NO molecules. **21 hrs**

UNIT II: **Principles of qualitative analysis:** Laboratory Methods in Semimicro qualitative Analysis, Filtration of precipitates, Washing of Precipitates, Heating of Solutions, Evaporation, Methods of Precipitating Sulphides-Types of Reactions Involved in Qualitative Analysis-Dry Reaction-Precipitation Reactions- Complexation Reactions-Preparation of Solution for Cations Testing on Semi Micro Scale. Principles of quantitative analysis-Definition- Standardisation, Experimental requirements of Volumetric analysis- Types of Titrations. Indicators for Acid-Base Titrations, Precipitation-Titrations-Redox Titrations- Self Indicators-External Indicators-Gravimetric analysis -Conditions for Precipitation-Choice of Precipitants-Types of Organic Precipitants-Specific and selective precipitants-Sequestering Agents-Solubility of Precipitates-Theories of Precipitation-Co-Precipitation-Post Precipitation-Effect of Digestion-Washing of Precipitates-Types and Care of Crucibles. **21hrs**

UNIT III: **Shapes of molecules**: Hybridisation and Geometry of molecule - Methane, Ethane, Ethylene, Acetylene and Benzene. Polar effects- Explanation with examples - Inductive effect, Inductomeric effect, Electromeric effect, Mesomeric effect,

Resonance effect, Hyperconjugation and Steric effects-Steric inhibition of Resonance-Steric retardation and Steric acceleration. Cleavage of covalent bonds- Heterolytic fission-Carbocations, Carbanions- structure and stability. Homolytic fission- free radicals- structure and relative stability of free radical. **Alkanes:** Mechanism of free radical substitution of alkanes-halogenations of alkane- reactivity and selectivity.

21hrs

UNIT IV: **Thermodynamics I :** Thermodynamic functions-state functions and path functions. Exact and inexact differential, Zeroth law of thermodynamics-statement-application, First law of Thermodynamics-statement, equation, Internal energy and enthalpy, relationship between molecular heat capacity at constant volume and constant pressure for an ideal gas-calculation of q, ΔE & ΔH for the expansion of ideal gases under reversible, isothermal and adiabatic conditions. **Thermochemistry** -Enthalpy of reaction, enthalpy of combustion, enthalpy of solutions, enthalpy of dilution, differential & intergral heats of solution & dilution, laws of thermo Chemistry, bond energy, calculation of bond energy using thermo chemical data, application of bond energy data, variation of enthalpy of reaction with temperature-Kirchoff's equation.

21hrs

UNIT V: **Solutions:** Solutions of gases in liquids, factors influencing solubility of a gas, Henry's law. Solutions of liquids in liquids - Raoult's Law, vapour pressure of ideal solutions, vapour pressure of non-ideal solutions, vapour pressure- composition curves, boiling point-composition curves of completely miscible binary solutions, fractional distillation of completely miscible binary liquid solutions, azeotropic mixtures. Solubility of partially miscible liquids pairs, Phenol- water system, Triethylamine water system, nicotine-water system, effect of impurities on CST, distillation of immiscible liquid pairs. **21hrs**

RECOMMENDED TEXTBOOKS:

1. Elements of Analytical Chemistry. R.Gopalan, P.S.Subramanian, K.Rengarajan- 3rd edition
2. Principles of Inorganic Chemistry B.R.Puri L.R. Sharma & K.C.Kalia 28th edn – Vallabh publications.2003
3. Organic Chemistry by P.L.Soni , Sultan Chand and Sons, 28th edition , 2012
4. Organic Chemistry by Bahl &Arun Bahl ,11th edn ,Sultan Chand and Co.2010
5. Organic Chemistry by Morrison & Boyd ,7th edn , Pearson India 2011
6. Principles of Physical Chemistry – Puri & Sharma 41st edn Vishal Publishing Co. 2004.
7. Physical Chemistry – Samuel Glasstone, David Lewis, Palgrave Macmillan 1993

8. Guide book to mechanism in Organic Chemistry by Peter Sykes, 6th edition , Pearson Publications, 2003

REFERENCES:

1. Text book of Qualitative chemical analysis 1st edition- G.H.Jeffery, J.Bassett, J.Mendham, R.C.Deynery.
2. Text book of Quantitative Inorganic analysis-Vogal ELBS III edition, (1976) and IV Edition (1985)
3. Text book of Quantitative Inorganic analysis-Vogal ELBS III edition, (1976) and IV Edition (1985)
4. Organic Chemistry by Finar Vol II 3rd edition ELBS
5. Text book of Physical Chemistry by A.S.Negi & S.C.Anand. 1st edn New Age International.
6. Text book of Physical Chemistry – Kapoor Vol 1,2,3 & 4. Mac Millan
7. Thermodynamics for chemists – Samuel Glasstone, Ist edition East West Press.
9. An Introduction to Chemical Thermodynamics by Rastogi & Misra, 6 th Revised editionVikas Publishing House.
10. Physical Chemistry by P.W. Atkins, 10 th edition Oxford University Press.

PERIODICALS:

1. Education in Chemistry
2. Indian academy of Sciences-Proceedings-Chemical Sciences
3. Current Science
4. Journal of Inorganic Chemistry
5. Journal of American Chemical Society

WEBSITES & e-LEARNING:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER- II

Title of the Course: Core 2- General Chemistry-II

Teaching hours: 15 × 7 = 105 **Credits: 5**
Course Code: CH18/2C/GC2 **L T P 4 3 0**

Objectives:

1. To learn the fundamentals in nuclear Chemistry.
2. To study the mechanism of addition reactions to alkenes and alkynes.
3. To understand the concept of aromaticity.
4. To study the mechanisms of Aromatic electrophilic , nucleophilic substitution and elimination reactions.
5. To study the concepts and applications of II and III law of Thermodynamics

UNIT I: **Fundamental particles of nucleus:** Nucleon terminology-isobars, isotopes, isomers, mirror nuclei, properties of nucleus - mass, radius, spin - Nuclear forces operative between nucleons. Magnitude of nuclear forces. Stability of nucleus, N/P ratio-curves-stability belts-Nuclear binding energy-mass defect, simple calculations involving mass defect and binding energy per nucleon. Magic numbers, Structure of Nucleus-Liquid drop model-shell model. Artificial transmutation of elements, Induced radioactivity, radio isotopes. Nuclear fission by thermal neutrons and nuclear fusion. **21hrs**

UNIT II: .**Alkenes-**Mechanism of Electrophilic and Free radical additions of alkenes-Addition of halogens, hydrogen halides, Markonikoff's rule, Peroxide effect in hydrogen bromide addition- addition of sulphuric acid, water, hydroboration (Addition of diborane to ethylene and propylene only), ozonolysis, hydroxylation with $KMnO_4$, allylic substitution by NBS. **Dienes**-Classification, stability and chemical reactivity-1,2 and 1,4- addition to conjugated dienes, kinetic and thermodynamic control of reaction-Diels-Alder reaction. **Alkynes**-Acidity of acetylene, Addition of water in presence of $HgSO_4$ catalyst, halogens, hydrogen halides, hydroboration and ozonolysis. **21hrs**

UNIT III: **Aromaticity:** Huckel's rule of Aromaticity and its simple applications-Benzene, Naphthalene, Anthracene and Phenanthrene. **Polynuclear hydrocarbons-** Naphthalene, Anthracene -synthesis, properties, and uses. **Aromatic electrophilic**

substitution reaction–orientation and reactivity- Mechanism of nitration, sulphonation , halogenations , Friedal craft's alkylation and acylation. Nuclear and side chain halogenations. **Aromatic nucleophilic substitution** - Activated aryl halides – Benzyne mechanism -Effect of substituents on reactivity. **Aliphatic nucleophilic substitution reaction**– Mechanism and stereochemistry of SN_1, SN_2, SN_i reaction- effect of solvents, leaving groups, nucleophiles and substrates.Elimination reaction-E1 and E2 eliminations-Mechanism and stereochemistry, dehydration of alcohols and dehydrohalogenation-Hoffmann and Saytzeff's rule. **21hrs**

UNIT IV: **Thermodynamics II**: Need for second law, statements of second law, concept of entropy-definition-entropy changes in isothermal expansion of an ideal gas, cyclic, reversible and irreversible processes, physical transformation-calculation of entropy changes of an ideal gas with changes in temperature, volume and pressure. Entropy of mixing-Gibbs free energy-Helmholtz free energy- their variation with temperature, pressure and volume. Criteria for spontaneity, Gibbs Helmholtz equation, derivation and applications. Fundamental equations of thermodynamics-Maxwell's relationship- thermodynamic equation of state. **21hrs**

UNIT V: **Partial molar properties**: Partial molar free energy-chemical potential-Gibbs Duhem equation-chemical potential and other thermodynamic functions-relationship with enthalpy, internal energy and work function. Variation of chemical potential with temperature and pressure-chemical potential in a system of pure solid, pure liquid and ideal gas mixture. Gibbs–Duhem Margules equation. Concept of fugacity and activity. Determination of fugacity of gas-activity and activity coefficient. **Thermodynamics III**-Statement-Nernst heat theorem-Evaluation of absolute entropies from heat capacity measurements-exceptions to the third law. **21 hrs**

RECOMMENDED TEXTBOOKS:

1. Organic Chemistry by P.L.Soni , Sultan Chand and Sons, 28th edition , 2012
2. Organic Chemistry by Bahl &Arun Bahl ,11th edn ,Sultan Chand and Co.2010
3. Organic Chemistry by Morrison & Boyd ,7th edn , Pearson India 2011
4. Guide book to mechanism in Organic Chemistry by Peter Sykes, 6th edition , Pearson Publications, 2003
5. Physical Chemistry – Samuel Glasstone, David Lewis, Palgrave Macmillan 1993
6. Principles of Inorganic Chemistry B.R.Puri L.R. Sharma & K.C.Kalia 28thedn – Vallabh publications.2003

7. Text Book of Physical Chemistry – P.L.Soni – O.P.Dharmarha – U.N.Dash, Sultan Chand and Sons, 22nd revised edition.
8. Advanced Physical Chemistry – J.N.Gurtu and A.Gurtu, A Pragathi edition.
9. Principles of Physical Chemistry – Puri & Sharma 41stedn Vishal Publishing Co. 2000.
10. Atkins, Physical Chemistry, Julio de Paula Peter Atkins, 10th edition, Oxford University press.

REFERENCE BOOKS:

1. Organic Chemistry by Finar Vol II 3rd edition ELBS
2. Text book of Quantitative Inorganic analysis-Vogal ELBS III edition, (1976) and IV Edition (1985)
3. Textbook of Quantitative Inorganic analysis-Vogal ELBS III edition, (1976) and IV Edition (1985)
4. Textbook of Physical Chemistry by A.S.Neg & S.C.Anand. 1st edition, New Age International
5. Text book of Physical Chemistry – Kapoor Vol 1, 2, 3 & 4. Mac Millan
6. Thermodynamics for Chemists–Samuel Glasstone, 2007. D. Van Nostrand Company.

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

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SEMESTERS I & II

MAJOR PRACTICALS

Title of the Course: Core 3- Practical 1 - Volumetric Analysis

Teaching hrs: 30 x 3= 90 **Credits: 4**

Course Code: CH18/2C/PR1

ACIDIMETRY

1. Estimation of Borax—Standard Sodium carbonate.
2. Estimation of Oxalic acid - Standard Oxalic acid.
3. Estimation of Sodium carbonate and Sodium hydrogen carbonate present in a mixture
4. *Estimation of temporary and permanent hardness of water.

PERMANGANIMETRY

5. Estimation of Ferrous ammonium sulphate-Standard Ferrous sulphate.
6. Estimation of Oxalic acid- Standard Ferrous sulphate.
7. Estimation of water of crystallization in Mohr's salt by titration with Potassium Permanganate

DICHROMETRY

8. Estimation of Ferrous ion against dichromate using diphenylamine as Internal indicator.

COMPLEXOMETRY

9. Estimation of Magnesium/Zinc using EDTA

***IODOMETRY**

10. Estimation of Copper-Standard Potassium dichromate

***CERIMETRY**

11. Estimation of Ferrous ion

***For internal assessment only**

END SEMESTER PRACTICALEXAMINATION

I B.Sc Chemistry SEMESTERS I & II

QUESTION BANK

Title of the Course: Core 3-Practical 1 -Volumetric Analysis **Time: 3 hrs**

Course code: CH18/2C/PR1 **Max. Marks: 60**

1. You are provided with oxalic acid solution. Estimate volumetrically the amount of oxalic acid present in the whole of the given solution. You are supplied with approximately decinormal solution of sodium hydroxide and pure crystalline oxalic acid. Get your burette and balance readings attested by the examiner.
2. You are given borax solution. Estimate volumetrically the amount of borax present in the whole of the given solution. You are supplied with approximately decinormal solution of hydrochloric acid and pure anhydrous sodium carbonate. Get your burette and balance readings attesed by the examiner
3. You are given ferrous ammonium sulphate solution. Estimate volumetrically the amount of ferrous ammonium sulphate present in the whole of the given solution. You are supplied with approximately decinormal solution of potassium permanganate and pure crystalline oxalic acid. Get your burette readings attested by the examiner
4. You are given oxalic acid solution. Estimate volumetrically the amount of oxalic acid present in the whole of the given solution. You are supplied with approximately decinormal solution of potassium permanganate and pure ferrous ammonium sulphate crystals. Get your burette readings and the weights attested by the examiner.
5. You are given magnesium sulphate solution. Estimate volumetrically the amount of magnesium sulphate present in the whole of the given solution. You are supplied with approximately decinormal solution of EDTA and pure crystalline zinc sulphate Get your burette and the weights attested by the examiner.
6. You are given a solution of amixture of Sodium carbonate and Sodium hydrogen carbonate. Estimate volumetrically the amount of Sodium carbonate and Sodium hydrogen carbonate present in the mixture. You are supplied with approximately decinormal solution of Hydrochloric acid and pure anhydrous Sodium carbonate. Get your burette and the weights attested by the examiner.

SCHEME OF VALUATION

Continuous Assessment	**:**	**40 marks**
External marks	**:**	**60 marks [50+ 10 marks for Record]**
Total	**:**	**100 marks**

Volumetric analysis

Error upto 2%	:	50 marks
Error from 2.1% to 3%	:	45 marks
Error from 3.1% to 4%	:	35 marks
Error above 4%	:	20 marks
Arithmetic error	- reduce 1 mark	
Wrong calculation	- reduce 20% of the marks secured	
No calculation	- reduce 40% of the marks secured	

SEMESTER- III

Title of the Course: Core 4-Organic Chemistry -I

Teaching hours: 15 × 7 = 105 **Credits: 5**

Course Code: CH18/3C/OC1 **L T P 4 3 0**

Objectives:

1. To study the reactions of alcohols and acids.
2. To study the mechanism of nucleophilic addition to carbonyl compounds.
3. To study the preparation and properties of Dicarboxylic acids and Heterocyclic compounds.
4. To study the reactions of Amines and Nitro compounds.
5. To study the synthesis and properties of Amino acids and structure of Proteins.

COURSE OUTLINE

UNIT I: **Phenols and Alcohols**: Acidic character of Phenols & Alcohols-Explanation on the basis of resonance stabilization. Ring substitution in phenols-orientation of phenolic group towards electrophiles. Mechanism of esterification, nitration, sulphonation, halogenation, coupling with diazonium salts. Kolbe's reaction, Reimer Tieman reaction, Gattermann reaction, Houben Hoesch reaction and Phthalein fusion reaction. Alpha and beta naphthols-preparation, properties and uses. **Unsaturated alcohols-** Preparation and reactions of Allyl alcohol **21hrs**

UNIT II: Carbonyl Compounds: Polarisation and acidity of alpha hydrogen in carbonyl compounds. Mechanism of Nucleophilic addition-Reactions of Carbonyl compounds with $NaHSO_3$, HCN, RMgX, $H_2N\text{-}NH_2$, RNH_2, $C_6H_5NH_2$, phenyl hydrazine and 2,4-dinitro phenyl hydrazine. Mechanisms of Aldol and Benzoin condensations, Perkin, Knoevenagel, Claisen, Wittig, Cannizaro and Reformatsky reactions. Mechanism of Reduction of carbonyl compounds with sodium borohydride, $LiAlH_4$, Wolf-Kishner, Clemmenson reduction and MPV reduction. Grignard reagent- Preparation and synthetic applications only. Characteristics reactions of Active methylene group-preparation and synthetic uses of Malonic ester, Acetoaceticesters and cyanoacetic esters. Tautomerism-definition- Keto-enol tautomerism (Identification, acid and base catalysed inter conversions, mechanism, preparations and characteristics) **21 hrs**

UNIT III: **Dicarboxylic Acids**- Preparation and properties of oxalic, Malonic, Succinic, Glutaric and Adipic acids. Unsaturated dicarboxylic acid- Preparation and properties of Maleic and Fumaric acid.) **Heterocyclic Compounds:** Aromaticity of heterocyclic compounds - Synthesis and reactions of Pyrrole, Furan, Thiophene, Pyridine,

Quinoline, Isoquinoline and Indole with special reference to Skraup, Bischler, Napieralski and Fischer-indole synthesis. **21 hrs**

UNIT IV.. **Nitro Compounds-** Conversions of nitrobenzene to ortho, para, meta dinitrobenzene, TNT. Aromatic nitrocompounds-Reduction in neutral, acidic and alkaline media. **Amines:** Basicity of amines, various reactions of amines, Diazotisation and its mechanism. Synthetic application of diazonium salts. Diazomethane and diazoacetic esters-preparation, structures and their synthetic uses **Dyes-**Theory of colour and constitution, classification-according to structure and method of application. Preparation and uses of 1.Azo dye-Methyl orange, 2.Triphenyl methane dye-Malachite green, 3.Phthalein dye-Phenolphthalein and fluorescein, 4. Vat dye-Indigo, 5.Anthraquinone dye-Alizarin **21 hrs**

UNIT V: **Aminoacids and Proteins:** Aminoacids-Classification of amino acids-essential and non essential aminoacids-Preparation of alpha amino acids-from halogenated acids, Gabriels phthalimide synthesis, Strecker synthesis. Properties and reactions-Zwitter ions, isoelectric points - peptide synthesis (Bergmann' s method only)-structure determination of polypeptides-endgroup analysis. Proteins-Classification based on physical and chemical properties and physiological function- Primary and secondary structures of proteins-Helical and sheet structures (Elementary treatment only)-Denaturation of proteins-Colour reaction of proteins. Nucleic acids- Nucleoside, Nucleotides- functions of Nucleotides, Nucleotides as energy carriers, types of Nucleic acid, Structure and functions of nucleic acids. **21 hrs**

RECOMMENDED TEXT BOOKS:

1. Principles of Inorganic Chemistry B.R.Puri L.R. Sharma & K.C.Kalia 28th edn – Vallabh publications, 2003
2. Organic Chemistry by P.L.Soni , Sultan Chand and Sons, 28th edition , 2012
3. Organic Chemistry by Bahl &Arun Bahl ,11th edn ,Sultan Chand and Co.2010
4. Organic Chemistry by Morrison & Boyd ,7th edn , Pearson India 2011 .
5. Text book of Physical Chemistry by Puri & Sharma 41st edn Vishal Publishing Co. 2003.
6. Physical chemistry by Samuel Glasstone, David Lewis, Palgrave Macmillan 1993
7. Text Book of Physical Chemistry – P.L.Soni – O.P.Dharmarha – U.N.Dash, Sultan Chand and Sons, 22nd revised edition.
8. Guide book to mechanism in Organic Chemistry by Peter Sykes, 6th edition , Pearson Publications, 2003
9. Introduction to solids, L.V. Azaroff MacGraw Hill New york 1960
10. Solid State Chemistry and its Applications, 2nd Edition, Student Edition, Anthony R.West, 2014, Wiley

REFERENCE BOOKS:

1. Text book of Quantitative Inorganic analysis-Vogal ELBS III edition, (1976) and IV Edition (1985)
2. Organic Chemistry by Finar Vol II 3rd edition ELBS
3. UG-Organic Chemistry, Volume II, Jagadamba Singh & L.D.S. Yadav, 8th edition 2013.

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of Inorganic Chemistry.
7. Journal of American chemical society

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER- IV

Title of the Course: Core 5- Inorganic Chemistry-I

Teaching hours: 15 × 7 =105 **Credits: 5**

Course Code: CH18/4C/IC1 **L T P 4 3 0**

Objectives:

1. To provide the basic concepts in the field of metallurgy
2. To study the Synthesis and applications of polymers
3. To provide the importance of inorganic pigments
4. To study the extraction and separation of lanthanide and Actinide elements
5. To understand elementary structure of crystals

COURSE OUTLINE

UNIT I: **Basic metallurgical processes**: ores, minerals-Metal ore mines in India, General methods of extraction-concentration methods, reduction methods, refining processes. Extraction of Ti, V, Cr, Ni from their principle ores preparation and properties of compounds of Ti, V, Cr, Ni, co-oxides, halides oxyhalides and metal salts **21hrs**

UNIT II: **Synthesis, Properties and Applications of polymers:** Main group containing polymers: polysiloxanes, polysilanes, Polysilicates-classification, preparation and applications. Transition metal containing polymers. Sulphur nitrogen polymers, Boron based polymers. -Maddrell's salts–coordination polymers with two and three dimensional network compounds. **21 hrs**

UNIT III : Inorganic solids of technological importance: Solid electrolytes- cationic, anionic, mixed inorganic pigments colour solids,white and black pigments. Molecular materials and fullerides, molecular materials & chemistry one diamentional metals ,molecular magnets, inorganic crystals, Composition, Characteristics and applications of various types of Cast iron, Plain carbon and Alloy steels, Copper, Aluminium and their alloys like Duralumin, Brass and Bronze. **21hrs**

UNIT IV: Inner transition metals – Lanthanides and Actinides - Extraction, Separation techniques, Extraction of thorium and uranium- Artificial synthesis of trans uranium elements- Significance of rare earths – Electronic Configurations – Common oxidation states– Lanthanide Contraction– consequences **21hrs**

UNITV: Solid state: Introduction-Elements of Symmetry-Symmetry operations. Classification into groups-Point groups of molecules- H_2O & NH_3 only. (Restrict to C_{2V}, C_{3V} & C_{2h})-

Space lattice, Unit lattice, packing- hcp & ccp, Bravais Lattices-Different crystal systems, Miller indices, Designation of planes, X-ray diffraction, Bragg's equation, rotating crystallography method, powder diffraction-structure determination. Structure of rock salt. Sodium chloride, Cesium chloride Structures. Schottky and Frenkel defects. **21hrs**

RECOMMENDED TEXTBOOKS:

1. Principles of inorganic Chemistry B.R.Puri L.R. Sharma & K.C.Kalia 28th edn – Vallabh publications.2003
2. Text Book of Inorganic Chemistry P.L.Soni M.Katyal 20th edn Sultan Chand & Sons. 2004.
3. Vogl's text book of quantitative Inorganic Analysis – Longman press.
4. Text book of qualitative Inorganic Analysis – Vogel ELBS III edn 1976, IV edn 1985.

REFERENCE BOOKS:

1. Theoretical inorganic Chemistry, M.C.day Jr and J.Selbin. Reinhold, Newyork 1962.
2. Inorganic Chemistry Shriver & Atkins 3rd edn, Oxford University Press 1999.
3. The nature of the chemical Bond, L.Pauling – 3rd edn, Cornell University Press,Newyork 1960.
4. Inorganic chemistry J.Huheey, Harper's Row Publishers.

PERIODICALS:

1. Current Science.
2. Education in Chemistry.
3. Journal of Nuclear Chemistry.
4. Journal of American Chemical Society.

WEBSITES & e-LEARNING SOURCES:

- www.virtlab.com
- http://nptel.ac.in
- MATLAB
- mooc.org
- http://swayam.gov.in

SEMESTERS – III & IV

MAJOR PRACTICALS

Title of the Course: Core 6- Practical 2- Inorganic Qualitative Analysis

Course Code: CH 18/4C/PR2 **Credits: 4**

Teaching hours: 30 x 3 = 90

Analysis of a mixture containing two anions one of which is interferring and two cations.

Anions:

Non interfering Cl^- Br^-, CO_3^{2-}, SO_4^{2-} and NO_3^-

Interferring PO_4^{3-}, BO_3^{3-}, AsO_3^{3-}, F^-, $C_2O_4^{2-}$ and CrO_4^{2-}

Cations: Pb^{2+}, Cu^{2+}, Bi^{3+}, Cd^{2+}, Fe^{2+}, Fe^{3+}, Al^{3+}, Co^{2+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+} and NH_4^+

End Semester Practical Examination

II B.Sc Chemistry-Semesters-III & IV

QUESTION BANK

Title of the Course: Core 6-Practical 2-Inorganic Qualitative Analysis

Course Code: CH18/4C/PR2 **Time: 3hrs**

Max. Marks: 60

Analyze systematically the given mixture and report for one interfering anion, one non- interfering anion and two cations

SCHEME OF VALUVATION

Total Marks = 100 (CA 40+End Semester 60)

Each metal ion	24 marks	(2 x 12 marks)
Non- Interfering anion	12 marks	
Interfering anion	14 marks	
Record	10 marks	
Total	60	

SEMESTER - V

Title of the Course: Core 7- Physical Chemistry

Teaching hours: 15 X 4= 60 hrs **Credits: 4**

Course Code: CH18/5C/PHY **L T P 3 1 0**

Objectives:

1. To study the colligative properties and Nernst distribution law.
2. To understand the concepts in ionic equilibria.
3. To learn principles and photochemical processes.
4. To study the atomic structures in terms of quantum mechanical principles.
5. To study the Phase equilibria.

COURSE OUTLINE

UNIT I: Colligative Properties: Osmosis and Osmotic pressure, Determination of molar mass of the solute from vapour pressure lowering, elevation in boiling point, Depression in freezing point and Osmotic pressure measurements. Vant Hoffs factors and deviations. **Nernst distribution law**, validity of the law, thermodynamic derivation, deviation from distribution Law **–** association, dissociation and chemical combination of the solute with one of the solvents. Applications – association and dissociation of a solute, complex ions and solvent extraction. **12hrs**

UNIT II: **Ionic Equilibria:** 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 salt – applications of solubility product principle. **12hrs**

UNIT III: Photochemistry – Difference between thermal and photochemical processes – Laws of photochemistry – Grothus- Draper law , Beer-Lamberts law and Stark Einsteins law- Quantum yield. Jablonski diagram depicting various processes in excited state, Qualitative description of fluorescence, Phosphoresence, non-radiative processes (internal conversion, intersystem crossing),Photosensitization and Chemiluminescence. **12hrs**

UNIT IV: Quantum Chemistry: Failures of classical theory, Black Body radiation, quantum theory of radiation, photoelectric effect, dual character of electron-de Broglie equation-Davisson and Germer experiment. Bohr's model atom (no derivation), spectrum of hydrogen atom, Compton effect, Heinsberg uncertaininty principle, postulates of quantum mechanics, Schrodinger wave equation (no derivation), significance of Ψ and Ψ^2Eigen values and eigen functions. **12 hrs**

UNIT V: Phase Equilibria: Definition of terms-phase, component, degrees of freedom, Gibbs phase rule (Statement only). Applications to one component systems-water, sulphur systems. Two component system- solid-liquid equilibria. Simple eutectic-Lead-silver system. Compound formation with congruent melting point-Magneisum-zinc system. Incongruent melting point-sodium-potassium system. Salt-hydrates- KI- water, $FeCl_3$-water, freezing mixtures. **12hrs**

RECOMMENDED TEXTBOOKS:

1. Principles of Physical Chemistry Puri and Sharma and Pathania 2003 Millenium edition, Vishal Publishing Co.
2. Undergraduate Physical Chemistry, Gurtu. Gurthu Volume I, II, III 5th edition (2013), Pragathi Prakashan
3. Text Book of Physical Chemistry – P.L.Soni – O.P.Dharmarha – U.N.Dash, Sultan Chand and Sons, 22nd revised edition.
4. Physical Chemisry, Peter Atkins. Julio De Paula, Ninth edition (2010), Oxford University press.

REFERENCE BOOKS:

1. Physical Chemistry by Bhal and Arun Bhal.
2. Photochemistry by Arora.

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of Polymer Research

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER- V

Title of the Course: Core 8-Organic Chemistry-II

Teaching hours: 15 × 4 = 60 **Credits: 4**

Course Code: CH18/5C/OC2 **L T P 3 1 0**

Objectives:

1. To understand the concepts of stereoisomerism and asymmetric synthesis.
2. To study the structure and properties of Carbohydrates.
3. To study the conformational analysis of open chain compounds and cyclohexane ring systems
4. To study the mechanism of some rearrangement reactions .
5. To study the chemistry of natural products- Alkaloids and Terpenes

COURSE OUTLINE

UNIT I: **Stereoisomerism:** Definition-classification into optical and geometrical isomerisms. Gerometric isomerism-cis and trans isomers, syn and anti and E, Z-nomenclature, Methods of assigning configuration, Auwer's skita rule. Optical isomerism-Optical activity-Specific rotations. Conditions for optical activity-assymmetrical center-chirality-chiral and achiral molecules-meaning of + and-/ d and l notations- Elements of symmetry-Racemisation- methods of racemisation and mechanism of racemisation-Resolution- methods of resolution(mechanical, seeding, biochemical and conversion into diastereoisomers)- Assymmetric synthesis-partial and asymmetric synthesis, Walden inversion, Projection formulae- Fischer, Flying Wedge, Saw horse and Newmann Projection formulae- Configurational notations of optical isomers-D and L notations, Cahn Ingold and Prelog rules-R,S-notations of optical isomers with one and two asymmetric carbons-Erythro and Threo representations. **12hrs**

UNIT II: **Carbohydrates:** Carbohydrates-classification, constitution of glucose and fructose. Reactions of glucose and fructose-osazone formation, mutarotation and its mechanism-cyclic structures-pyranose and furanose forms. Haworth projection formula, Epimerisation. Configuration of monosaccharides -chain lengthening and chain shortening of aldoses, Interconversion of aldoses and ketoses. Disaccharides-Properties and structure of sucrose & maltose (Structural elucidation not necessary). Polysaccharides- Properties and structure of starch and cellulose (Structural elucidation not necessary. **12hrs**

UNIT III: Conformationl Analysis: Introduction of the terms conformers, configuration, dihedral angle, torsional strain and conformational analysis. Conformational analysis of ethane and n-butane with energy diagrams Conformers of Cyclohexane-boat, chair and skew boat forms-axial and equatorial bonds-ring flipping. **12hrs**

UNIT IV: Molecular Rearrangements: Classification as Anionotropic, Cationotropic-intermolecular and intramolecular rearrangement. Mechanism of rearrangements-Pinacol-pinacolone, Beckmann, Benzidine, Hoffmann, Curtius, Benzil-Benzilic acid and Claisen rearrangments. **12hrs**

UNIT V: Natural Products: Terpenoids-classification, isoprene rule, Camphor and Alpha Pinene-structural elucidation. Alkaloids-general methods of isolation and general methods of structure determination of Connine, Piperine and Nicotine. Vitamins-Thiamine, Riboflavin, Pyridoxine and Ascorbic acid-Structure, occurrence and biological importance- structural elucidation of Ascorbic acid only. **12hrs**

RECOMMENDED TEXTBOOKS:

1. Stereochemistry: Conformation and Mechanism by P.S.Kalsi , 7th New Age International Pvt Ltd Publishers , 2015
2. Organic Chemistry by Morrison & Boyd ,7th edn , Pearson India 2011
3. Organic chemistry by Finar Vol I ,Pearson Education; 5 edition (2002)
4. Organic chemistry by Finar Vol II, Pearson Education; 5 edition (2002)

REFERENCES BOOKS:

1. Stereochemistry of carbon compounds by L.Eliel Mac Graw Hill
2. Chemistry of Natural Production by Gurdeep .R.Chatwal. Himalaya Publishing
3. UG-Organic Chemistry, Volume I, Jagadamba Singh & L.D.S. Yadav, 8th edition 2013.

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER – V

Title of the course: Core 9- Inorganic Chemistry-II

Teaching hours: 15 x 4 = 60 **Credits: 4**

Course Code: CH18/5C/IC2 **L T P 3 1 0**

Objectives:

1. To focus on the basics of co-ordination chemistry,
2. To impart knowledge about various theories of co-ordination chemistry
3. To study about the stability constants of co-ordination complexes and its applications
4. To concentrate on Bio-Inorganic chemistry stressing on the role of metal ions in biological system.
5. To understand the structure and bonding in organometallic compounds.

COURSE OUTLINE

UNIT I: Introduction to coordination compounds: ligand classification, nomenclature of coordination compounds, isomerism in complexes-ionization, hydrate, position, linkage, geometrical, and optical isomerisms. Kinetic vs Thermodynamic stability of complexes.. **12hrs**

UNIT II: Coordination Chemistry I: Theories of coordination-Werner, Sidgwick, EAN rule, Pauling's valence bond theory, Electroneutrality principle, Pi bonding concept, Inner & outer orbital complexes-Merits & Demerits. Crystal Field Theory, Octahedral and tetrahedral splitting,10 Dq, Stabilization energy-CFSE. Measurement of 10Dq. Factors affecting 10Dq-Spectrochemical Series-Jahn Teller effect. **12hrs**

UNIT III: Coordination Chemistry II Stability constant- stepwise and overall stability constant, Job's method, Chelate effect. Introduction to macrocyclic ligand- Crown ethers.Synthesis and applications.Factors affecting stability of complexes. Chelate complexes with ethylene diammine, EDTA, DMG. Applications of complexes in Qualitative and Quantitative Analysis. **12hrs**

UNIT IV: Oxygen carriers: Haemoglobin, Myoglobin, Bohr effect, Perutz mechanism-oxygen dissociation curves-Vitamin B12-Role of Cobalt-Zinc containing enzymes-Carboxy peptidase, Carbonic anhydrase. Function of Na^+/K^+ Mechanism of ion pump-Role of Calcium. Role of Copper in ascorbic acid oxidase, Function of ceruloplasmin, Transamination reactions- Role of Magnesium in Hexakinase. **12hrs**

UNIT V: Organometallic chemistry: Ferrocene-Preparation Reactivity. Carbonyls and nitrosyls Structure and bonding-Preparation Reactivity. Alkene and Alkyne complexes. π bonding. Zeisse salt. Organo lithium and Boron complexes. **12hrs**

RECOMMENDED TEXTBOOKS:

1. Principles of Inorganic chemistry B.R.Puri, L.R.Sharma & K.C.Kalia 28th edn, Vallabh Publications, 2003.
2. Co-ordination Chemistry, D. Banerjea, Tata McGraw Hill, 1993.
3. Vogel's text book of quantitative Inorganic Analysis – Longman press.
4. Inorganic Chemistry, J.E.Huheey, Harper & Collins NY, IV edn.

REFERENCE BOOKS:

1. Inorganic Chemistry D.F.Shrivers, P.W.Atkins, Oxford University Press, 3rd Edn. 1999.
2. Inorganic Chemistry K.F.Purcell & J.C.Kotz Swb Saunders Co. 1977.
3. Co-ordination Chemistry - SFA Kettle, ELBS, 1973.

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings - Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER-V

Title of the Course: Core 10-Analytical Chemistry

Teaching hours: 15 x 4 = 60 **Credits: 4**

Course Code: CH18/5C/ANC **L T P 3 1 0**

Objectives:

1. To impart knowledge and skill in data analysis, separation techniques,
2. To expose to electro analytical techniques
3. To introduce computer applications in chemistry.
4. To study the various separation techniques – Chromatography
5. To study the principle and estimation of ions by colourimetric methods

COURSE OUTLINE

UNIT I : **Data Analysis:** Theory of errors-idea of significant figures and its importance with examples. Precision,Accuracy-methods of expressing accuracy-error analysis, minimizing errors, methods of expressing precision-average deviation-standard deviation and confidence limit. Reporting of data, Presentation of tabulated data, scatter diagram, Method of least squares, correlation for straight lines only. **12hrs**

UNIT II: **Colorimetric Analysis :** Lambert's Law , Beer Lamberts Law ,Validity and application , Methods of Colour Measurement using Duboscq Colorimeter, Photoelectric Colorimeter , Colorimetric estimation of selected ions- Fe,Ni,Cr, Determination of composition of complexes **12hrs**

UNIT III: Electro analytical methods: Polarography - concentration polarization-DME-convection, migration and diffusion current-Ilkovic equation (derivation not required). Experimental assembly-electrodes-solutions current voltage curve - Effect of oxygen -Applications. **Electrogravimetry:** Introduction, theory, instrumentation for constant-Current methods . Applicatons **12hrs**

UNIT IV: Separation and Purification Techniques: Separation techniques-principles involved in the separation of precipitates-solvent extraction. Purification of solid organic compounds-solvent extraction. Chromatography-Principles of adsorption, column chromatography-TLC and paper chromatography-R_f values-applications. Ion exchange Chromatography-principle experimental Techniques-applications-separation of Zn-Mg, Co-Ni, Cd-Zn and chloride-Bromide. **12hrs**

UNIT V: Introduction to computers & its Applications: Introduction to Computers- Characteristics of a Computer, Types of Computers, Block Diagram of a digital Computer Input & Output devices, memory Storage Systems. Central Processing Unit, Binary Numbers, Floating Points, Computational errors. Computer viruses high level and low level languages. Basic Introduction to C, Importance of C, Sample C programs, Basic Structure of C programs. Programming Style- Executive C program., algorithmic flow chart, Character set, C tokens Keywords and Identifiers Variable constant and data types. Declaration of variables. Deferring Symbolic Constants (Basic Constants Only). Application of C program in Chemistry: Determination of normality, Molarity and Molality of solutions, Calculation of pH, Internet Service- Provides in India, Terms used in internet www.http, html, URL, TCP/IP bandwidth, dial-up services, ISDN. E-mail-free e-mail providers, search engines uses of internet for chemistry, data base. **12hrs**

RECOMMENDED TEXT BOOKS:

1. Elements of Analytical Chemistry –R.Gopalan,P.S.Subramanian and K.Rengarajan Sultan Chand and Sons.
2. Instrumental methods of analysis by H.Willard, W.Merrit, J Dean. 6^{th} edn Van Nostrand 1981
2. Computers and their applications to chemistry Ramesh Kumari, Narosa.
3. Text book of quantitative inorganic analysis- Vogal ELBS III Edition, (1976) and IV Edition (1985)
4. Polarography by Kapoor Sultan and Chand
5. ANSCIC by Balgurusamy

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER-V

Title of the Course: Elective 1- Spectroscopy

Teaching hours: 15 X 5 = 75 **Credits: 5**

Course Code: CH18/5E/SPE **L T P 4 1 0**

Objective:

1. To introduce spectroscopy at basic level.
2. To learn the principles of various techniques.
3. To understand the working and instrumentation.
4. To study the applications of spectroscopic techniques.
5. To elucidate the structure of compounds.

COURSE OUTLINE

UNIT I: **Infrared Spectroscopy:** origin of IR spectroscopy-Simple Harmonic oscillator model of vibrator-Zero point energy-Force constant & bond strengths-Anharmonicity-Morse potential energy diagram- Energy of vibrational levels. Rotational fine structure, Born-Oppenheimer approximation, normal modes of vibration, fundamentals, overtones, hot bands, selection rules. Instrumentation, single and double beam instrument- Applications-Organic structural elucidation-simple problems, Hydrogen bonding, kinetic studies, identifying cis-trans isomers, linkage isomers, tautomers, impurity detection–quality control-Base line correction method-Quantitative application. **15hrs**

UNIT II: **Raman Spectroscopy:** Origin-Stokes and antistokes lines-Quantum theory- Classical theory. Vibrational Raman spectra-selection rule- polarisability ellipsoids-Changes in polarisability ellipsoids of water and CO_2 during vibrations-plot of polarisability vs displacement coordinate-rule of mutual exclusion principle-instrumentation-depolarization ratio-usefulness-connection to Raman spectroscopy-application. **15hrs**

UNIT III: **UV-Vis Spectroscopy**: Energy levels – molecular orbitals. Electronic transitions types-Broad nature of bands. vibrational and rotational transitions accompanying. Selection rule-Effect of Substitution and conjugation-Bathochromic, Hypsochromic, hyper and hypochromic shifts. Instrumentation-Woodward Feiser rules. Applications-ualitative and Quantitative analysis. **15hrs**

UNIT IV: NMR Spectroscopy: ^{1}H NMR only-Origin-Nuclear Zeeman effect. Instrumentation-Chemical shift.Factors affecting chemical shift. Spin spin coupling-fine structure, Pascals triangle-intensity ratio- Fermi contact interaction-Proton count Integration ratio. AB, AX spectrum-Exchange reaction-ethanol spectrum-AMX-Simple problems. **15hrs**

UNIT V: **Mass Spectroscopy**-Basic principles. Theory-Instrumentation-ion production. Molecular ion, Fragment ions, Meta stable peaks-Fragmentation pattern in alkanes, alkenes, alkynes, alcohols, & aromatic alcohols, phenols, Toluene McLafferty rearrangement-nitrogen rule-ring rule . **15hrs**

RECOMMENDED TEXT BOOKS:

1. Applications of absorption spectroscopy of organic compounds by J.Dyer
2. Spectroscopy of Organic chemistry by P.S.kalsi.

REFERENCE TEXTBOOKS:

1. Organic spectroscopy by William Kemp 3rd edn W.H.Freeman & Co,1991
2. Spectroscopic methods in organic chemistry by Silverstein Bassler
3. Instrumental method of analysis by H.Willard, W.Merrit, J Dean. 6th edn Van Nostrand 1981
4. Fundamental of molecular spectroscopy, C.N.Banwell McGraw Hill Newyork 1966

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER- VI

Title of the Course: Core 11- Applied Chemistry

Teaching hours: 15 x 4 = 60 **Credits: 3**

Course Code: CH18/6C/APC **L T P 3 1 0**

Objectives:

1. To know the processes involved in dairy products, sugar and paper manufacture.
2. To inculcate basic knowledge and awareness in agricultural chemistry
3. To minimize the use of hazardous substance through Green chemistry.
4. To learn the need of chemistry in agriculture.
5. To get exposure in usage of chemical products in day to day life.

COURSE OUTLINE

UNIT I: **Dairy Chemistry:** Milk definition, general composition-physico changes taking place in milk due to boiling, pasteurization, sterlization and homogenisation explanation. Components of milk – lipids, proteins carbohydrates vitamins, ash and mineral matters names and functions. Definition and compositions of cream, butter, ghee, ice-cream, stabilizer and emulsifier. Milk powder, definition and need for making manufacture of whole milk powder by spray drying process. **12hrs**

UNIT II: **Sugar And Paper Industry:** Sugar industry: double sulphitation process, refining and grading of sugar. Saccharin synthesis and uses of sugar substitute. Ethanol: manufacture from molasses by fermentation. Paper industry: manufacture of paper: production of sulphite pulp and conversion to paper (bleaching, filling, sizing and calendaring) **12hrs**

UNIT III: **Green Chemistry:** What is green chemistry, Need for green chemistry, Green solvents- PEG,ionic liquids, supercritical fluids, how to compare greenness of solvents. Biocatalysis: importance of biocatalysis in green chemistry. Future trends in Green Chemistry - Oxidation reagents and catalysts, combinational green chemistry, Green chemistry in sustainable development. **12 hrs**

UNIT IV: **Agricultural Chemistry:** Introduction to soil. Soil Classification & Survey; Properties of soil: Soil Texture; Soil water: Soil Temperature; Soil Colloids; Soil Minerals; Soil pH acidity and alkalinity; Buffering Soil; Soil Fertility, Soil Formation. Fertilizers-Classification of fertilizers, nitrogeneous, fertilizers

Phosphate fertilizers, Potash fertilizers, effect of fertilizers. Insecticides: DDT, BHC Herbicides: 2,4-D and 2,4,5-T Fungicides: Bordeaux mixture, Bio-gas, production and Manure. **12hrs**

UNIT V: **Chemistry in daily life:** Synthetic food Additives, Preservatives, colourants and flavours Water: Domestic waste water treatment -Treatment by primary and secondary process. Glass: composition, manufacture and uses Cement: Manufacture: wet and dry process, composition and setting of cement Soaps: Types of soaps, cleansing action of soaps, synthetic detergents **Batteries:** Primary and secondary batteries, Working of following batteries: Pb storage and Li – battery, Solar cell **12 hrs**

RECOMMENEDED TEXT BOOKS:

1. Jayshree Ghosh Fundamantals of Aplied chemistry Sultan chaud & co
2. R Gopalan P.S Subranian K. Rangarajan Elements of Analtyical Chemistry Sultan & co

REFERENCE BOOKS:

1. Biswas. A.K., Frontiers in Applied Chemistry, Narosa publishing house, 1989
2. Vermain , O.P, Narula A.C, Applied Chemisry theory and books
3. E.Stocchi : Industrial Chemistry, Vol –I , Ellis Horwood Ltd.UK.
4. B.A Yagodin (Ed). Agricultural Chemistry, 2 volumes, MIR publishers (Moscow), 1976.
5. J.A. Kent: Riegel's Handbook of Industrial chemistry, CBS Publishers, New Delhi.
6. Ahluwalia, V.K & Kidwai, MR, New Trends in Green Chemistry, Anamalaya publishers (2005).
7. Matlack , A.S.Introduction to green chemistry, Marcel Dekker (2001)

PERIODICALS:

1. Education in Chemistry
2. Current Science

WEBSITES &e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER-VI

Title of the Course: Core 12-Pharmaceutical Chemistry

Teaching hours: 15 x 4= 60 **Credits: 4**

Course Code: CH18/6C/PHA **L T P 3 1 0**

Objectives:

1. To make the student understand important of terminologies ,the cause and treatment involved in common diseases.
2. To focus on the drugs which are essential as antibiotics
3. It provides information on the classification and the importance of anaesthetics
4. It focuses on the clinical uses and adverse effects of analgesics
5. It focuses on the blood composition and its importance in terms of hematological agents

COURSE OUTLINE:

UNIT I: Introduction-Terminologies used-molecular pharmacology, pharmacodynamics, pharmacophore, metabolites, antimetabolites, bacteria virus fungi-Clinical chemistry-causes of common diseases and their treatment by drugs- Jaundice, piles, leprosy, epilepsy, typhoid, malaria, cholera, filarial, cancer-diagnostic tests for sugar, salt, cholestrol in blood and urine-First aid in emergencies. **12hrs**

UNIT II: Antibiotics Definition and mode of action. Structure and clinical uses of chloroamphenical, penicilin, Streptomycin and tetracyclines. SAR and synthesis of chloramphenical and penicillin only. Hypoglycemic drugs and antineoplastic drugs. **12hrs**

UNIT III: Anaesthetics-Definition-general and local classification- Gaseous-nitrous oxide, ethers halothane, trichloroethylene only - Intraveneous anaesthetics. Thiopentone, sodium, methohexitone and propandiol, local anaesthetics-esters-cocaine-benzocaine, procaine, amides-cinchocaine-Tranquilizers, sedatives, hypnotics and psychodelic drugs (LSD, Hashish). **12hrs**

UNIT IV: Analgesics, antipyretics and anti-inflammatory agents-Classification, action and analgesics, narcotic and synthetic analgesics-pethidine and methadone. Salicylic acid and its derivatives, p-amino phenol derivatives, indolyl, aryl-acetic acid derivatives-clinical uses and adverse effects. **12hrs**

UNIT V: Blood-Grouping, composition, Rh factor, Blood pressure-hypertension and hypotension Function of plasma proteins. Role of blood as oxygen carrier. Clotting mechanism-Hematological Agents-Anticoagulent and coagulant drugs-Heparin, coumarine, citric acid, quinoxaline- Vitamin K, proteins, amino acids. **12hrs**

RECOMMENDED TEXT BOOKS:

1. Pharmaceutical chemistry, Dr.S.Lakshmi, 3rd edn. Sultan and sons
2. A text book of synthetic drugs O.D.Tyogi M.Yadav, 4th edn 1996 ANMOL publications Pvt.Ltd
3. A text book of pharmaceutical chemistry – Jayashree ghosh 1st edn Sultan Chand & sons.
4. Essentials of Bio chemistry –U.Satyanarayanan – Books & Allied (p) ltd
5. Organisation pharmaceutical chemistry by Harikisher singh etal
6. Synthetic drugs O.P Agarwal
7. Synthetic drugs- Gurdeep Chatwal's Medical laboratory, Ramnaik –Sood

REFERENCE BOOKS:

1. Text books of pharmaceutical chemistry Batlay and Drivers
2. Text book of pharmaceutical chemistry – Raviling
3. Bio chemistry – A L Lehninger
4. A text book of bio chemistry – S.Ambika
5. Medicinal chemistry – A Sutosh kar – New age

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER - VI

Title of the Course: Elective 2 – Chemical Kinetics & Electrochemistry

Teaching hours: 15 x 5 = 75 **Credits: 5**

Course Code: CH18/6E/CKE **L T P 4 1 0**

Objectives:

1. To study the concepts of Chemical kinetics.
2. To learn the theories of Chemical kinetics.
3. To study the ionic conductivity.
4. To study the electrochemical systems.
5. To study the applications of emf measurements.

COURSE OUTLINE:

UNIT I: **Chemical Kinetics I** -: Rate of chemical reactions, factors affecting the rate of a chemical reaction, order and molecularity of a reaction. Derivation of rate constants for zero, first, second and third order reactions (equal concentration of reactants) derivation of time for half change- methods of determining order of a reaction- van't Hoff differntial rate method, integrated rate expression method, half life method and Ostwald's isolation method- experimental methods involved in the study of kinetics- volumetry, manometry, polarimetry and colorimetry. **15 hrs**

Unit II : **Chemical Kinetics II** - Complex reactions – reversible, parallel and consecutive reactions (only examples) Effect of temperature on the rate of reactions- Arrhenius equation , concept of energy of activation- calculation of Arrhenius parameters.Collision theory and derivation of rate constant for bimolecular reaction- Lindemann's theory of unimolecular reactions- Absolute Reaction rate theory (ARRT). Thermodynamic derivation of rate constant for a bimolecular reaction. Comparison of collision theory with ARRT- Significance of entropy and free energy of activation. **15hrs**

Unit III: Electrochemistry I: Conductance in electrolytic solutions, Cell constant- Measurement cell constant, equivalent conductivity, Kholrauschs law and its application-relation between specific, equivalent and molecular conductivity, Effect of dilution on Conductivities. Ionic mobility, transport number, determination by Hittorf's and Moving boundary method, Debye-Huckel Onsager theory, equation (no derivation), verification. Debye Falkenhagen, Debye-Wein effect, Debye-Huckel limiting law (no derivation). Applications of conductivity measurements- determination of pH, Ka, Ksp, conductometric titrations-acid-base titrations and precipitation titrations. **15 hrs**

UNIT IV: Electrochemistry II: Galvanic cells- reversible and irreversible cells, e.m.f and its measurements- standard cell. Types of reversible electrodes-metal/metal ion, metal amalgam/metal ion, metal insoluble salt/anion, gas electrode, redox electrode. Electrode reaction, measurement of electrode potentials using reference electrodes- Standard hydrogen electrode, calomel electrode. Derivation of Nernst equation for emf of cells and electrode potentials-sign convention, sign of e.m.f and spontaneity of a reaction, calculation of ΔG and ΔH from emf data. Chemical cells with and without transport, concentration cells with and without transference. **15hrs**

UNIT V: Electrochemistry III: Application of Gibbs Helmholtz equation in the calculation of thermodynamic quantities in Galvanic cells. Determination of pH using quinhydrone electrode and glass electrode. Potentiometric titrations- acid.-base titrations, redox titrations, precipitation titrations, valency of ions, transport-number, K_{sp} and activity coefficient of electrolytes. Irreversible electrode processes- polarisation and over voltage, decomposition voltage. Determination of decomposition voltage and over voltage. Corrosion-mechanism, types and methods of prevention. **15hrs**

RECOMMENDED TEXT BOOKS:

1. Text book of Physical Chemistry by Puri & Sharma 41st edn Vishal Publishing Co. 2004
2. Physical chemistry by Samuel Glasstone , David Lewis, Palgrave Macmillan 1993
3. Text book of Physical Chemistry by A.S.Negi & S.C.Anand. 1st edn New Age International
4. Text book of Physical Chemistry - Kapoor Vol 1,2,3 & 4. MacMillan
5. Text Book of Physical Chemistry – P.L.Soni-O.P.Dharmarha – U.N.Dash, Sultan Chand and Sons, 22nd revised edition.
6. Advanced Physical Chemistry – J.N.Gurtu and A.Gurtu, A Pragathi edition.

REFERENCE BOOKS:

1. Electrochemistry – Samuel Glasstone
2. Chemical Kinetics - Laidler.

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

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5. http://swayam.gov.in

Title of the Course: Elective 3- Materials Chemistry

Teaching hours: 15 x 5 = 75Hrs **Credits: 5**

Course Code: CH18/6E/MAC **L T P 4 1 0**

Objectives:

1. To introduce the world of polymer materials
2. To study the synthetic methods and characterization of polymer materials
3. To study the speciality materials and their applications
4. To introduce and give an insight into the fascinating area of nanoscience and its development.
5. To learn the experimental techniques of nano scale synthesis, properties and characterization.

COURSE OUTLINE

UNIT I: Introduction to Polymers-Classification of polymers- natural and synthetic polymers.Thermoplastic and thermosetting. Functionality- degree of polymerization. Types and mechanism of polymerization- Addition (free radical, cationic, anionic), condensation and co polymerization 15 hrs

UNIT II: **Industrial Preparation characterization and application**- 1) PVC 2) Polyamide 3)PMMA 4) Phenolic Formaldehyde resin 5) Polysilane 6) Poly urethane 7) Poly carbonate. Number average (Cryoscopy and Ebullioscopy) and weight average(Light scattering technique) 15 hrs

UNIT III: Speciality materials- Ceramic &Refractory mateials-Introduction, classification, properties, raw materials, manufacturing and applications. Basic concepts of composite materials- metal matrix, fibre polymer matrix and fibre reinforced composites. 15 hrs

UNIT IV: Overview of Nano structures and Nanosynthesis- Origin of nano in ages. Quantum confinement- 1D,2D,3D and zero dimension. Experimental techniques for preparation, Bottom up - Sol- gel, Solvothermal, Coprecipitation, Chemical Vapour and Physical Vapour deposition. Top down- Mechanical grinding, ball milling, microlithography 15 hrs

UNIT V: Nano scale properties and nano materials- Size dependent variation in physical, chemical, optical, mechanical properties. Electrical properties- electrical conductivity, Magnetic properties- dia, para ferro and ferri and super Para magnetism. Nano materials- wires, tubes, CNT, graphene and nano clays . **15** hrs

RECOMMENDED TEXT BOOKS:

1. Introductory polymer chemistry – G.S.Mishra New Age 2007
2. Polymer science-V.R.Gowriker, N.V.Viswanathan and Jayadev sreedar New Age 2006
3. Principles of polymer science –P.Bhadur, N.V.Sastry, Alpha Science International Ltd 2005
4. Nanoscience and Nanotechnology: Fundamentals to Frontiers, M.S. Ramachandra Rao, Shubra Singh Wiley, India, First edition 2013.
5. Nano: The essentials, T. Pradeep Tata McGraw-Hill Publishing Company Limited, 2007.

REFERENCE BOOKS:

1. E.A.Collins, J.Bares and E.W.Billmeyer- Experiments in Polymer science, Wiley Inter science, Newyork 1973
2. Polymer science and Technology – Joel Fried 2nd edn., Prentice Hall PTR 2003
3. Polymer Chemistry an introduction M.P.Steven 3rd edn., Oxford Univ Press, USA 1999.
4. Nanostructure & Nanomaterials: Synthesis, properties & Applications G. Cao, Imperial College Press, 2004.

PERIODICALS:

1. Resonance- Journal of science education
2. Education in Chemistry
3. Indian academy of sciences-proceedings- Chemical Sciences
4. Current Science
5. Journal of Indian chemical education
6. Journal of American chemical society

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1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in
6. http://nanozone.org/
7. http://www.understandingnano.com/

SEMESTERS – V & VI

MAJOR PRACTICAL

Title of the Paper: Core 13- Practical 3- Organic Chemistry

Teaching hours: 30 x 4 = 120 **Credits: 3**

Course Code: CH18/6C/PR3

1. Determination of Boiling point of liquids

* 2. Estimation of Aniline

*3**.** Preparation based on the following reactions

(a) Oxidation

(b) Nitration

(c) Bromination

(d) Esterification

(e) Hydrolysis

(f) Diazotisation & Coupling

4. **Analysis of organic compounds** with one functional group & characterization with one derivative –Aromatic Aldehyde, Aromatic / Aliphatic Ketone ,Aromatic/ Aliphatic, Mono, Di, Unsaturated and saturated Carboxylic acid, Primary, secondary & Tertiary Amine, Simple Phenol, Resorcinol & β- Naphthol, Aromatic Ester, Aromatic mono amide and Diamide, Anilide, Mono Nitro and poly nitro compound and Carbohydrate (Monosaccharide).

The students will report on the following

- Aromatic/Aliphatic
- Saturated /Unsaturated
- Elements present [Nitrogen, Sulphur and halogens]
- Functional group
- Solid derivative

.*For internal assessment only.

END SEMESTER PRACTICAL EXAMINATION

III B.Sc SEMESTERS-V & VI

QUESTION BANK

Title of the Paper: Core 13- Practical-3 Organic Chemistry **Time: 3hrs**

Course Code: CH18/6C/PR3 **Max. Marks: 60**

(1) Systematically carry out suitable test on the given organic substance and report on the following

(a) Aliphatic/ Aromatic

(b) Saturated/ Unsaturated

(c) Elements present or absent-(Nitrogen, Sulphur and Halogens)

(d) Functional group

Confirm the above by a suitable colour reaction and prepare atleast one solid derivative and submit it for evaluation

Substances to be given-Benzaldehyde, Acetophenone, 2- Butanone , Glucose, Ethyl benzoate, Cinnamic acid, Succinic acid , Phthalic acid, Benzoic acid , Phenol ,Resorcinol, β- Naphthol, Nitrobenzene, Aniline, N,N- Dimethylaniline, Acetanilide, Benzamide, Urea

(2) Determine the boiling point of given liquid –Water, butan-2-one, butan-1-ol, Propan-2-ol

Scheme of valuation

Total marks = 100 (CA 40 and End Semester 60)

Organic analysis- 35 marks

Physical constant-15 marks

Record -10marks

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60 marks

Organic analysis-(a)Aliphatic/ Aromatic-4 marks (2x2)

(b)Saturated/ Unsaturated-4 marks (2x2)

(c)Elements present or absent-6 marks (3x2)

(d)Preliminary reaction -10 marks

(e) functional group-6 marks

(f) Derivative-5 marks

Physical constant- ±2°C - 15 marks

±3°C - 13 marks

±4°C - 10 marks

>4°C - 6 marks

SEMESTERS-V& VI

MAJOR PRACTICALS

Title of the Course: Core 14: Practical 4- Gravimetric Analysis

Teaching hours: 30 x 4 = 120 **Credits: 3**

Course Code: CH18/6C/PR4

1. Estimation of Lead as Lead chromate.
2. Estimation of Zinc as Zinc Oxinate
3. Estimation of Barium as Barium chromate.
4. Estimation of Barium as Barium sulphate.
5. Estimation of calcium as calcium oxalate monohydrate.
6. Estimation of Sulphate as Barium Sulphate

* 7 Estimation of Nickel as Nickel dimethyl glyoximate complex.

*8. Estimation of Copper as cuprous thiocyanate.

* 9. Estimation of Chloride as silver chloride.

* INTERNAL ASSESSMENT ONLY

END SEMESTER PRACTICAL EXAMINATION

III B.Sc Chemistry- SEMESTERS – V & VI

QUESTION BANK

Title of the Course: Core 14: Practical 4- Gravimetric Analysis

Course Code: CH18/6C/PR4 **Time: 3 hrs**

Max. Marks: 60

1. Estimate the amount of barium present in the whole of the given solution. You are provided with 5% K_2CrO_4 solution.
2. Estimate the amount of sulphate present in the whole of the given solution. You are provided with 4% $BaCl_2$ solution.
3. Estimate the amount of barium present in the whole of the given solution. You are provided with 2N H_2SO_4 solution.
4. Estimate the amount of Lead present in the whole of the given solution. You are provided with 5% $K_2Cr\ O_4$ solution.
5. Estimate the amount of Zinc present in the whole of the given solution. You are provided with 1% Oxine solution.

SCHEME OF VALUATION

Continuous Assessment – 40 marks
End Semester – 60 marks (50 + 10 marks for Record)
Total - 100 marks

Error up to 2% - 50 marks

2.1 - 3% - 45 marks

3.1-4% - 35 marks

>4 % - 20 marks

SEMESTERS –V & VI

MAJOR PRACTICALS

Title of the Course: Core 15- Practical 5-Physical Chemistry

Teaching hours: 30 x 4 =120 **Credits: 3**

Course Code: CH18/6C/PR5

1. KINETICS

Determination of rate constant

i. I order kinetics - Acid catalysed hydrolysis of an ester

ii. II order kinetics - Reaction between potassium perdisulphate and potassium iodide

iii. Zero order kinetics - Acid catalysed iodination of acetone.

2. Determination of K_f and Molecular Weight by Rast's Macro method

3. PHASE RULE

i. CST of Phenol-water system

ii. Effect of electrolyte on CST of phenol –water system and determination of concentration of the electrolyte.

iii. Determination of transition temperature of hydrated salts- Sodium acetate, sodium thiosulphate, strontium chloride (any one)

4. ELECTROCHEMISTRY

Conductivity

i. Determination of cell constant

ii. Equivalent conductance of strong and weak electrolyte solutions of atleast five different concentrations and to determine $\Lambda\infty$ for strong electrolyte

iii. Strong acid Vs Strong base - HCl against NaOH

iv. *Weak acid Vs strong base - CH_3COOH against NaOH

v. *Dissociation constant of a weak acid

5. POTENTIOMETRY

Acid base titration – HCl against NaOH

6 . *DISTRIBUTION LAW

Determination of

i. *Distribution coefficient of iodine between water and CCl_4

ii. *Equilibirium constant of the equilibrium

$KI + I_2 = KI_3$

iii. *Association factor of benzoic acid in benzene.

* For Internal Assessment only.

END SEMESTER PRACTICAL EXAMINATION

III B.Sc. CHEMISTRY – SEMESTERS V & VI

QUESTION BANK

Title of the Course: Core 15- Practical 5-Physical Chemistry **Time: 3hrs**

Course Code: CH18/6C/PR5 **Max. Marks: 60**

1. Determine the rate constant for the acid catalysed hydrolysis of the given ester with the given acid solution at room temperature.
2. Determine the rate constant of the reaction between potassium iodide and potassium persulphate at room temperature.
3. Find out the rate constant for the iodination of acetone at room temperature, using the given acid solution as catalyst.
4. Determine the molecular weight of the given solute. You are provided with a suitable solvent whose K_f value is----------
5. Determine the K_f of the given solvent. You are provided with a suitable solute whose molecular weight is ----------
6. Find out the concentration of the given sodium chloride solution. You are provided with pure phenol and solutions of sodium chloride.
7. Determine the transition temperature of the given hydrated salt, by thermometric method.
8. Find out the cell constant of the given conductivity cell using 0.1M and 0.01M potassium chloride solutions, whose specific conductivities are given. Determine the equivalent conductance of the given two solutions of known concentrations.
9. Determine the strength of the given hydrochloric acid by conductometric titration. You are provided with sodium hydroxide of known strength
10. Determine the strength of the given hydrochloric acid by potentiometric titration. You are provided with sodium hydroxide of known strength

SCHEME OF VALUATION

External Marks (60) + Internal Marks (40) = 100 Marks

Record	-	10 marks
Manipulation	-	15 marks
Experiment	-	35 marks
		60 marks

1. **Kinetics** Marks

Below a factor of 10	-	35
By a factor of 10	-	25
Above	-	10

2. **Molecular Weight & K_f** Marks

Error upto 10%	-	35
10 – 20%	-	30
Upto 30%	-	20
> 30%	-	10

3. **Phenol – NaCl** Marks

Error upto 10%	-	35
10 – 20%	-	30
Upto 30%	-	20
> 30%	-	10

4. **Transition Temperature** **Marks**

Error upto 2^oC	-	35
Upto 4^oC	-	30
Upto 6^oC	-	20
> 6^oC	-	10

5. **Conductivity**

		l/a	Λ_1	Λ_2
Error upto 10%	-	15+10+10		
Upto 15%	-	10+8+8		
> 15%	-	5+4+4		

6. **Conductometric Titration** & Potentiometric Titration

Error upto 10%	-	35
10 – 20%	-	30
Upto 30%	-	20
> 30	-	10

SEMESTER- I

(For I B.Sc. N&D / II B.Sc. AZB)

Title of the course: Allied Chemistry-General Chemistry

Teaching hours: 15 x 4 = 60 **Credits: 4**
Course Code: CH18/1A/NGC **L T P 3 1 0**
CH18/3A/ZGC

Objectives:

1. To have knowledge in food analysis.
2. To impart knowledge in Stereoisomerism.
3. To study biochemical separation techniques and create an awareness on organic compounds used as dyes.
4. To understand the basic aspects of structure and bonding in Inorganic complexes
5. To study the applications of Co-ordination Complexes

COURSE OUTLINE

UNIT I: **Analysis of food products:** Nutritional value of foods, idea about processing and analysis of food preservations and adulteration. Calorific value of Food. Standard caloric content in carbohydrates, Proteins and Fats. Oxidation of food stuffs. Synthetic food Additives , food colourants and flavours. **12 hrs**

UNIT II: **Stereo isomerism:** Optical isomerism, elements of symmetry, cause of optical activity, Lactic acid and tartaric acid, racemisation, resolution, R&S configuration, Geometrical isomerism of maleic and fumaric acid, keto-enol tautomerism. **12hrs**

UNIT III: **Biochemical separation techniques and Dyes:** Chromatography-Principle and application of column, paper, thin layer and Ion exchange chromatography. Electrophoresis- Principles, apparatus and application. Ultra centrifugation-principle. Dyes- Classification- Triphenyl methane dyes, Malachite green, p-rosaniline, azodyes- methyl orange, aniline yellow, food colours. **12hrs**

UNIT IV: **Chemical bonding**: Molecular orbital theory, bonding, antibonding and non bonding orbitals. Molecular orbital configuration of H_2, N_2, O_2 and Fluorine. Bond order, Diamagnetism and paramagnetism. Hydrides- classification, preparation and properties. Diborane, Sodium borohydride and Borazole-preparation, properties and structure. **12 hrs**

UNIT V: **Coordination Chemistry**: Nomenclature, Coordination Compounds, shapes of d-orbitals, Theories of Co-ordination complexes- Werner's theory, Sidgwicks theory

and Pauling's theory. Theory and structure of Chelation, Haemoglobin and Chlorophyll. Application of complexes-Qualitative and Quantitative analysis. **12hrs**

RECOMMENDED TEXT BOOK:

1. Text book of BioChemistry – Ambika Shanmugam.
2. Essentials of Biochemistry – Sathyanarayanan.

REFERENCE BOOKS:

1. Organic Chemistry- P.L.Soni, 28th edn, Sultan Chand and Sons (1999)
2. Principles of Inorganic Chemistry- B.R.Puri, L.R.Sharma & K.C.Kalia 28th edn, Vallabh publications (2003).
3. Nelson, D.L & Cox, M.M. Lehningers Principles of Biochemistry 7th Ed. W.H.Freeman

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER-II

(For I B.Sc. N&D/ II B.Sc. AZB)

Title of the course: Allied Chemistry- Bio organic Chemistry

Teaching hours: 15 x 4 = 60 **Credits: 4**

Course Code: CH18/2A/NBC **L T P 3 1 0**

CH18/4A/ZBC

Objectives:

1. To impart basic knowledge on carbohydrates metabolism.
2. To study the metabolism of lipid
3. To understand the role of amino acids and enzymes in human physiology.
4. To know about the physiological function of hormones.
5. To learn vitamins and protein structures.

COURSE OUTLINE

UNIT I: **Carbohydrates and its metabolism:** Classification-preparation and properties of monosachharides- glucose and fructose, discaccharides-Sucrose, Polysaccharides-starch and cellulose. **Nucleic Acids:** Nucleosides and Nucleotides, Structure of DNA (Watson – Crick model) and RNA types, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation. **12hrs**

UNIT II: **Concept of energy in biosystem:** Conversion of food into energy, glycolysis, TCA cycle, glycogenolysis, glycogenesis and gluconeogenesis. **Enzymes**-Definition, classification, nomenclature, specificity, isoenzymes, factors affecting enzyme activity-substrate concentration, pH and temperature,Michaelis-Menten equation, enzyme inhibitors- competitive, non-competitive and uncompetitive. **12hrs**

UNIT-III: **Hormones:** Definition, classification, mechanism of action of hormones-General functions. Posterior pituitary hormones-Oxytocin and anti-diuretic- Structure and function. Chemotherapy- Preparations, uses and mode of action of sulpha drugs, structure and use of penicillin and chloromycetin. **12hrs**

UNIT IV: **Vitamins**: Definition,Classification-Water solulble vitamins B_1,B_2,B_3,B_6 and B_{12} and Vitamin C. Fat soluble vitamins-A,D,E,K-Occurrence, deficiency diseases, biochemical roles and daily requirements. Steriods- Cholesterol, physical properties and biological function only. **12hrs**

UNIT-V: **Lipids and its metabolism:** Classification of lipids–saponifiable and non saponifiable lipids, phospholipids- different types, their consitutents, functions. Fatty acids- saturated - stearic and palmitic, formulae, unsaturated - oleic acid and essential fatty acids. Characterisation by iodine value, RM Value, acid number, saponification value (Definitions only). Amino acids- Classification and structures, amphoteric nature, isoelectric point, peptide bond. Proteins-Classification, Primary structure, protein digestion, transamination, oxidative deamination and urea cycle- inter -relationship of protein. **12hrs**

RECOMMENDED TEXT BOOK:

1. Text book of BioChemistry – Ambika Shanmugam.
2. Essentials of Biochemistry – Sathyanarayanan.

REFERENCE BOOKS:

1. Text book of natural products by chatwal –vol I Himalayan Publication.
2. Text book of BioChemistry - Agarwal, Goel Publications.
3. Fundamentals of BioChemistry – J. L. Jain, Sultan Chand and Sons.
4. Text book of Pharmaceutical Chemistry- Jayashree Ghosh

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http:/swayam.gov.in

SEMESTER- III
(For II B.Sc. Physics)

Title of the course: Allied Chemistry-General Chemistry 1

Teaching hours: 15 x 4 = 60 **Credits: 4**

Course Code: CH18/3A/PGC **L T P 3 1 0**

Objectives:

1. To introduce the concepts of qualitative and quantitative analysis and separation techniques
2. To bring an exposure to the applications of coordination chemistry
3. To provide the basic concepts in organic chemistry
4. To inculcate basic knowledge in photochemistry
5. To enable the students to understand the basic principles of electrochemistry

COURSE OUTLINE

UNIT I: **Analytical Chemistry-** Introduction to Quantitative and Qualitative Analysis-Principle of volumetric analysis – separation techniques-extration-distillation-crystallization-chromatographic separations-Principles and application of column, paper, thin layer, gas liquid and ion-exchange. **12hrs**

UNIT II: **Coordination chemistry:** Definition of terms, classification of ligands, Nomenclature of coordination compounds. Theories of co-ordination complexes-Werners theory, Sidgwick's theory and Pauling theory. Chelation, Biological role of Haemoglobin and Chlorophyll,Application of complexes- Qualitative and Quantitative analysis. **12hrs**

UNIT III: **Polar Effects:** Inductive, electromeric, mesomeric, hyperconjugative and steric effects-influence of effects in properties of compounds-Acidity and Basicity. Aromaticity-Huckles Rule concept of delocalization,Resonance energy-Benzene, **Electrophilic substitution**: Electrophilic substitution in benzene- Mechanism of nitration, halogenation, alkylation, acylation and sulphonation. **12hrs**

UNIT IV: **Photochemistry-** Beer-Lambert's law**,** Grothurs-Draper's law, Stark-Einstein's law of photochemical equivalence. Quantum yield- Examples with hydrogen and chlorine reaction. Photosynthesis, Jablonski diagram-Radiative process-Fluorescence, Phosphorescence, non-radiaative process-Internal conversion and Intersystem crossing, Chemiluminescence, Photosensitization-only definition with examples. **12hrs**

UNIT V: **Electrochemistry:** Definition of specific, equivalent and molar conductance and their determination, effect of dilution on conductance, Ostwald's dilution law, Kohlrausch's law and its applications Galvanic cells, Emf, Standard cell-Weston cadmium cell. Standard hydrogen electrode and calomel electrode in e.m.f. measurements Standard electrode potentials and its applications. Henderson equation, applications of pH and buffer in biological systems and Industries. **12hrs**

RECOMMENDED TEXT BOOKS:

1. Allied Chemistry- Gopalan and Sundaram, III edn., Sultan Chand and Sons.

REFERENCE BOOKS:

1. Organic chemistry, P.L.Soni 28th edn., Sultan Chand and Sons 1999.
2. Principles of Inorganic chemistry, B.R.Puri, L.R.Sharma & K.C.Kalia 28th edn., Vallabh publications 2003.
3. Principles of Physical chemistry – Puri & Sharma 41st edn Vishal Publishing Co. 2004
4. Essentials of Physical Chemistry- Bahl and Arun Bahl, Sultan Chand and Sons. 2009
5. Elements of Analytical Chemistry –R.Gopalan,P.S.Subramanian and K.Rengarajan Sultan Chand and Sons.

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. MATLAB
4. mooc.org
5. http://swayam.gov.in

SEMESTER-IV

(For II B.Sc Physics)

Title of the course: Allied Chemistry- General Chemistry 2

Teaching hours: 15 x 4 = 60 **Credits: 4**

Course Code: CH18/4A/ PGC **L T P 3 1 0**

Objectives:

1. To expose the students to the industrial applications of silicones and fertilizers
2. To gain knowledge on metal extraction and refining
3. To get acquainted with colloids
4. To introduce the concept of stereo isomerism in organic chemistry
5. To introduce the concept of phase rule and phase diagram

COURSE OUTLINE

UNIT I: **Industrial Chemistry:** Silicones-synthesis, properties and uses. Fuel gases- Natural gas, water gas, semiwater gas, carbureted water gas, producer gas. Inter halogen compounds ICl, BrF_3, IF_5, IF_7- preparation, properties, hybridization and structure, Fertilisers-Urea, Super phosphate of lime, Triple super phosphate. **12hrs**

UNIT II: **Metallurgy:** General methods of extraction of metals. Types of ores, methods of ore dressing, types of furnaces, reduction methods, types of refining, Van Arkel, Zone refining, Extraction of Copper, Uranium and Thorium **12hrs**

UNIT III: **Colloids:** Colloids state of matter-various types-classification-Sols-dialysis-electro osmosis-electrophoresis-stability of Colloid-protection action – Hardy-Schulze law-gold number- Emulsion: Types of emulsions-emulsifier with examples- Gels: Classification and preparation- Application of Colloids. **12hrs**

UNIT IV: **Stereoisomerism:** Geometrical isomerism of maleic and fumaric acid, cis, trans, E & Z nomenclature of geometrical isomers, Optical isomerism, elements of symmetry, cause of optical activity, Specific rotation-Determination of Specific rotation, Lactic acid and tartaric acid, Resolution, Racemisation and Walden inversion, Configuration-D&L, R&S. **12hrs**

UNIT V: **Phase rule:** Definition of terms in phase rule, Gibbs phase rule (no derivation) one component systems-water and sulphur systems, Reduced phase rule-two component system, Simple eutectic system. Eg. Lead-silver & Potassium iodide-water system **12hrs**

RECOMMENDED BOOKS:

1. Allied Chemistry- Gopalan and Sundaram, III edn.,Sultan Chand and Sons.

REFERENCE BOOKS:

1. Organic Chemistry P.L.Soni 28th edn Sultan Chand and Sons 1999
2. Principles of Inorganic chemistry B.R.Puri, L.R.Sharma & K.C.Kalia 28th edn, Vallabh publications 2003
3. Principles of Physical chemistry – Puri & Sharma 41st edn Vishal Publishing Co. 2004
4. Essentials of Physical Chemistry- Bahl and Arun Bahl, Sultan Chand and Sons. 2009

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3. MATLAB
4. mooc.org
5. http://swayam.gov.in

ALLIED CHEMISTRY PRACTICAL

I YEAR- SEMESTER I & II
(I B.Sc. N&D)
&
II YEAR- SEMESTER III & IV
(for II B.Sc. AZB & II B.Sc. PHYSICS)

Title of the Course: Allied Chemistry Practical-Volumetric & Organic Analysis

Teaching hours: 30 x 2= 60 **Credits: 2**

Course Code: CH18/2A/PRA & CH18/4A/PRA

VOLUMETRIC ANALYSIS

A**cidimetry- Alkalimetry**

1. Estimation of Borax using Methyl orange as indicator.

2. Estimation of Oxalic acid using Phenolphthalein as indicator.

Permanganimetry

3. Estimation of ferrous ammonium sulphate.

4. Estimation of oxalic acid.

Complexometry

5. Estimation of Magnesium/Zinc using EDTA

Dichrometry

6.*Estimation of ferrous ion using diphenyl amine as internal indicator.

Iodometry

7.*Estimation of copper sulphate using standard potassium dichromate.

***For internal assessment only**

ORGANIC ANALYSIS

Systematic Analysis of Organic Compounds with one functional group- Aromatic Aldehyde, Mono and dihydric phenols, β-Naphthol, Aromatic monocarboxylic acid, Aliphatic and Aromatic dicarboxylic acids, Carbohydrates-monosaccharide, Aliphatic diamide and Primary Aromatic Amine

1. Detection of elements- Nitrogen, Sulphur and Halogens.
2. Identification of Aliphatic or Aromatic compounds.
3. Identification of Saturated or Unsaturated compounds.
4. Identification of Functional group

END SEMESTER PRACTICAL EXAMINATIONS

(For I B.Sc N&D, II B.Sc. AZB & II B.Sc. PHYSICS)
SEMESTER II/IV

QUESTION BANK

Title of the Paper: Allied Chemistry Practical-Volumetric & Organic Analysis

Paper Code: CH18/2A/PRA & CH18/4A/PRA **Time: 3hrs**

Max. Marks: 60

1. Analyze volumetrically the amount of sodium carbonate present in the whole of the given solution. You are provided with a standard solution of sodium hydroxide and a link solution of hydrochloric acid.

2 Estimate the amount of Borax present in the whole of the given solution. You are given a standard sodium carbonate solution and a link hydrochloric acid solution.

3. Estimate the amount of hydrochloric acid present in the whole of the given solution. You are provided with a standard solution of sulphuric acid and a link solution of sodium hydroxide.

4. Estimate the amount of oxalic acid present in the whole of the given solution. You are provided with a standard solution of hydrochloric acid and a link solution of sodium hydroxide.

5. Estimate the amount of Ferrous sulphate present in the whole of the given solution. You are provided with a standard solution of ferrous ammonium sulphate and a link solution of potassium permanganate.

6. Estimate the amount of Ferrous ammonium sulphate present in the whole of the given solution. You are provided with a standard solution of oxalic acid and a link solution of potassium permanganate.

7. Estimate the amount of oxalic acid present in the whole of the given solution. You are provided with a standard solution of ferrous sulphate and a link solution of potassium permanganate.

8. Estimate the amount of Magnesium sulphate present in the whole of the given solution. You are provided with a standard solution of Magnesium sulphate and a link solution of EDTA.

SCHEME OF VALUATION

Total Marks - 100

External Marks (60) + Internal Marks (40) =100 Marks

Record	- 10
Volumetric analysis	- 25
Organic Analysis	- 25
Total Marks	**60**

Scheme of Valuation: Volumetric Analysis

Error upto 2% - 25 marks

Error upto 2.1 - 3% - 20 marks

Error upto 3.1 - 4% - 15 marks

Error > 4% - 10 marks

Arithmetic error - Reduce 1 mark.

Wrong calculation - Reduce 20% of the marks

No calculation - Reduce 40% of the marks

Analyse the given organic substance and report for the following.

a. Aromatic or Aliphatic
b. Saturated or Unsaturated
c. Presence or Absence of the elements -Nitrogen, Sulphur and Halogens
d. Functional group present

List of substances given for Analysis

1. Benzaldehyde
2. Phenol
3. β-Naphthol
4. Resorcinol
5. Glucose
6. Benzoic acid
7. Phthalic acid
8. Succinic acid
9. Aniline
10. Urea

Scheme of Valuation: Organic Analysis: 25 Marks

Elements	(3 x 2)	6 Marks
Aliphatic or Aromatic	(2 tests x 2)	4 Marks
Saturated or Unsaturated	(2 tests x 2)	4 Marks
Preliminary reactions		6 Marks
Functional group tests		5 Marks

PART-IV NON MAJOR ELECTIVE

SEMESTER-I

(Common to I Year B.A/B.Sc./B.Com)

Title of the Course: Non Major Elective 1 - Cosmetology

Teaching hours: 15 x 2 = 30 **Credits: 2**

Course Code: CH18/1N/COS **L T P 2 0 0**

Objectives:

1. To improve one's own personal appearance and develop self confidence.
2. To impart skill in cosmetology.
3. To acquire knowledge in cosmetic science.

COURSE OUTLINE:

UNIT I: Self analysis, grooming, professional behavior, skin care, theory of massage, facials, facial manipulation, make-up- purpose and types- corrective make-up using optical illusions. **10hrs**

UNIT II: Hair oils and hair creams, hair removers- temporary removal of hair, depilation process and epilation process. Permanent removal of hair. Hand lotions and creams- Preparation and applications. Hazards of cosmetics and quality control. **10hrs**

UNIT III: Face creams: Types of face creams-cold, vanishing, cleaning and bleaching creams- preparation and application. Hand lotions and creams-simple method of preparation. Facial, manicure, pedicure, waxing, make-up & hair style. **10hrs**

RECOMMENDED TEXT BOOKS:

1. Text book of Cosmetology by Mary Haely Eastern Economy edition.
2. The complete book of beauty care- Aruna Anand.

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. mooc.org
4. http://swayam.gov.in

PART IV – NON MAJOR ELECTIVE

SEMESTER – II

(Common to I B.A/B.Sc./B.Com.)

Title of the Course: Non Major Elective 2- Dyeing and Printing of Textiles

Teaching hours: 15 x 2 = 30 **Credits: 2**

Course Code: CH18/2N/DPT **L T P 2 0 0**

Objective:

1. To have a knowledge about the types and characteristics of dyes
2. To impart skill in dyeing and printing of textiles
3. To inculcate entrepreneur skills in textile dyeing

COURSE OUTLINE

UNIT I: Dyes: Classification-Main types of dyes, and their characteristics-Natural dyes and synthestic dyes, Natuual dyes based on plant origin. Synthetic dyes-cationic, anionic, direct dyes, mordant dyes, vat dyes and sulphur dyes. **10hrs**

UNIT II: Basic methods of dyeing-stock dyeing, Top dyeing, Dope dyeing, Yarn dyeing, Piece dyeing, Beck dyeing, Jig dyeing, Padding. . **10hrs**

UNIT III: Methods of printing-Block, Roller, Screen, Tie and dye, Batik and Kalamkari printing techniques. **10hrs**

RECOMMENDED TEXT BOOK:

1.Textiles- Fibre to Fabrics- Dr. Bernard, P. Lorbman

WEBSITES & e-LEARNING SOURCES:

1. www.virtlab.com
2. http://nptel.ac.in
3. mooc.org
4. http://swayam.gov.in

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS), CHENNAI-600 008

END SEMESTER EXAMINATION

TEMPLATE OF THE QUESTION PAPER

Common to all UG Core, Elective and Allied Theory

Title of the Course - Max. Marks: 100

Course code- Time: 3 hrs

SECTION-A

ANSWER ALL THE QUESTIONS **10Q x 2=20**

Question Numbers 1-10

Definition, statement or very short answers with 2 lines, Choosing 2 question from each of the 5 units in the syllabus.

Section B

Answer all the Questions 5Qx8=40 marks

Question numbers 11 to 15 (5 Questions)

5 Questions to be given with an internal choice choosing one question from each unit (ie)

11a or 11b

Section-C

Answer any two questions 2Qx20=40 marks

Question Numbers 16- 19 (4 Questions)

4 questions to be given with a maximum of 4 subdivisions (a, b, c, d) giving equal weightage to all the five units in the syllabus.

Note: Equal weightage to be given to all the 5 units in the syllabus

Section-A=10Q x 2 marks	= 20 marks
Section-B=5Q x 8 marks	= 40 marks
Section C=2Q x 20 marks	= 40 marks
Total	**= 100 marks**

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)
CHENNAI-600 008

END SEMESTER EXAMINATION

Template of the Question Paper Common to All Non Major Electives

Title of the Course: Non Major Elective 1 - Cosmetology

Title of the Course: Non Major Elective 2- Dyeing and Printing of Textiles

Course Code: CH18/1N/COS & CH18/2N/DPT

Max. Marks: 50
Time: 2 hrs

ANSWER ANY TEN QUESTIONS OUT OF TWELVE QUESTIONS **10Q x 5=50**

NOTE: Equal weightage to be given to all the three units in the syllabus.