

**KONGUNADU ARTS AND SCIENCE COLLEGE  
(AUTONOMOUS)  
COIMBATORE – 641 029**



**DEPARTMENT OF CHEMISTRY (UG)**

**CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)  
(2018 - 2019 onwards)**

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)  
Coimbatore – 641029**

**Vision**

Developing the total personality of every student in a holistic way by adhering to the principles of **Swami Vivekananda** and **Mahatma Gandhi**.

**Mission**

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education.

**DEPARTMENT OF CHEMISTRY****Vision**

To provide personal, intellectual and professional growth of the students and to impart an ideal science education with the emphasis on man making and character building.

**Mission**

To produce quality and knowledgeable chemistry graduates capable of creating new developments for the society and preparing chemists of highest caliber for global standards, simultaneously imbibing Indian cultural values in the minds of the students.

### **PROGRAMME OUTCOME (PO)**

On the successful completion of the programme, the following are the expected outcomes

#### **PO 1**

Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day today life.

#### **PO 2**

Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments.

#### **PO 3**

The skills of observations and drawing logical inferences from the scientific experiments

#### **PO4**

Been able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems

#### **PO5**

An understanding of professional, ethical, and social responsibilities

#### **PO6**

Determine the scope and perceive unique areas for further study and employability

#### **PO7**

Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

#### **PO8**

To be exposed to the different process used in industries and their applications

### **PROGRAMME SPECIFIC OUTCOME (PSO)**

#### **PSO 1**

Graduates will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistry.

#### **PSO 2**

Graduates are able to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments.

#### **PSO 3**

Graduates are able to grab enormous existing job opportunities at all levels of chemical, medical, food processing, material industries and educational institutions.

#### **PSO 4**

The graduates become entrepreneurs to own enterprises based on the national and International market potentials.

#### **PSO 5**

Graduates can perform good social responsibility with greater in ethics and conducive use of natural resources.

**UCH 1**

**CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)  
(APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC YEAR  
2018-2019 ONWARDS)**

Semester	Part	Subject Code	Title of the Paper	Instruction	Exam Marks			Duration of Exam (Hours)	Credits
					CIA	ESE	Total		
I	I	18TML101	Language I@	6	25	75	100	3	3
	II	18ENG101	English I	6	25	75	100	3	3
	III	18UCH101	Core Chemistry Paper- I Inorganic, Organic & Physical Chemistry - I	6	25	75	100	3	5
			Core Chemistry Practical- I Inorganic qualitative analysis & Preparations	3	-	-	-	-	-
		18UMA1A2/ 18UZO1A1	Allied Mathematics Paper -I/ Allied Zoology Paper- I	7/ 5	25/ 20	75/ 55	100/7 5	3	5/ 4
		Allied Zoology Practical	2	-	-	-	-	-	
	IV	18EVS101	Environmental Studies* *	2	-	50	50	3	2
II	I	18TML202	Language II@	6	25	75	100	3	3
	II	18ENG202	English II	6	25	75	100	3	3
	III	18UCH202	Core Chemistry Paper- II Inorganic, Organic & Physical Chemistry - II	6	25	75	100	3	5
		18UCH2CL	Core Chemistry Practical- I Inorganic qualitative analysis & Preparations	3	40	60	100	3	2
		18UMA2A2/ 18UZO2A2	Allied Mathematics Paper - II/Allied Zoology Paper- II	7/ 5	25/ 20	75/ 55	100/7 5	3	5/ 4
		18UZO2AL	Allied Zoology Practical	2	20	30	50	3	2
	IV	18VED201	Value Education-Moral & Ethics* *	2	-	50	50	3	2
III	I	18TML303	Language III @	6	25	75	100	3	3
	II	18ENG303	English III	6	25	75	100	3	3
	III	18UCH303	Core Chemistry Paper- III Inorganic, Organic & Physical Chemistry - III	4	25	75	100	3	4
			Core Chemistry Practical- II Inorganic volumetric and organic qualitative analysis	3	-	-	-	-	-
		18UPH3A1	Allied Physics Paper- I	4	20	55	75	3	4
		Allied Physics Practical- I	3	-	-	-	-	-	

**UCH 2**

	IV	18UGA3S1	Skill Based Subject- I General Awareness (on line)	2	25	75	100	3	3
		18TBT301/18 TAT301/ 18UHR3N1	Basic Tamil*/ Advanced Tamil**/ Non Major elective -I **	2	75		75	3	2
IV	I	18TML404	Language IV @	6	25	75	100	3	3
	II	18ENG404	English IV	6	25	75	100	3	3
	III	18UCH404	Core Chemistry paper- IV Inorganic, Organic & Physical Chemistry - IV	4	25	75	100	3	4
		18UCH4CM	Core Chemistry Practical- II Inorganic volumetric and organic qualitative analysis	3	40	60	100	6	3
		18UPH4A2	Allied Physics Paper- II	5	20	55	75	3	4
		18UPH4AL	Allied Physics Practical -I	2	20	30	50	3	2
	IV	18UCH4S2	Skill Based Subject -II Water chemistry	2	25	75	100	3	3
	IV	18TBT402/18 TAT402/ 18UWR4N2	Basic Tamil*/ Advanced Tamil**/ Non Major elective – II**	2		75	75	3	2
V	III	18UCH505	Core Chemistry Paper –V Spectroscopy and chromatographic techniques	3	25	75	100	3	3
		18UCH506	Core Chemistry Paper –VI Inorganic Chemistry – I	4	25	75	100	3	4
		18UCH507	Core Chemistry Paper –VII Organic Chemistry - I	4	25	75	100	3	4
		18UCH508	Core Chemistry Paper –VIII Physical Chemistry - I	4	25	75	100	3	4
		18UCH5E1	Major Elective -I	3	25	75	100	3	5
		18UCH6CN	Core Chemistry Practical -III Gravimetric Analysis	3	-	-	-	-	-
		18UCH6CO	Core Chemistry Practical–IV Physical Chemistry Experiments	4	-	-	-	-	-
		18UCH6CP	Core Chemistry Practical –V Application Oriented practical	3	-	-	-	-	-
	IV	18UCH5S3	Skill Based Subject-III Industrial Chemistry	2	25	75	100	3	3

### UCH 3

VI	III	18UCH609	Core Chemistry Paper-IX Inorganic Chemistry - II	4	25	75	100	3	4
		18UCH610	Core Chemistry Paper-X Organic Chemistry-II	4	25	75	100	3	4
		18UCH611	Core Chemistry Paper-XI Physical Chemistry - II	4	25	75	100	3	4
		18UCH6E1	Major Elective – II	3	25	75	100	3	5
		18UCH 6Z1	Project***	3	20	80	100	-	5
		18UCH6CN	Core Chemistry Practical- III Gravimetric Analysis	3	40	60	100	3	3
		18UCH6CO	Core Chemistry Practical-IV Physical Chemistry Experiments	3	40	60	100	3	3
		18UCH6CP	Core Chemistry Practical –V Application Oriented practicals	4	40	60	100	3	4
	IV	18UCH6S4	Skill Based Subject- IV Food chemistry	2	25	75	100	3	3
	V	18NCC/NSS/Y RC/ PYE101	Extension Activities*	-	50	-	50	-	1

@French/Hindi/Malayalam/Sanskrit

\* No End of Semester Examinations (ESE). Only Continuous Internal Assessment (CIA).

\*\* No Continuous Internal Assessment (CIA). Only End of Semester Examinations (ESE).

\*\*\* Project Report – 60 marks; Viva-voce – 20 marks; Internal – 20 marks

Marks %	Grade
85-100	O
70-84	D
60-69	A
50-59	B
40-49	C
<40	U (Reappear)

#### MAJOR ELECTIVE PAPERS

(Two papers are to be chosen from the following four papers.)

1. Polymer Chemistry
2. Nano and Dye Chemistry
3. Pharmaceutical Chemistry
4. Agricultural Chemistry
5. Green Chemistry
6. Chemical Industry

#### Non-Major Elective Papers

1. Human Rights

## UCH 4

2. Women's Rights
3. Consumer awareness

### **JOC – Job Oriented Course**

Textile Chemistry

### **Tally Table**

<b>S.No.</b>	<b>Part</b>	<b>Subject</b>	<b>Marks</b>	<b>Credits</b>
1.	I	Language – Tamil/Hindi/Malayalam/French/Sanskrit	400	12
2.	II	English	400	12
3.	III	Core – Theory/Practical	1600	60
		Allied	400	20
		Electives/ Project	300	15
4.	IV	Basic Tamil/Advanced Tamil/Non-major elective	150	4
		Skill Based Subjects	400	12
		Environmental studies	50	2
		Value Education	50	2
5.	V	Extension Activities	50	1
<b>Total</b>			<b>3800</b>	<b>140</b>

Note:

- CBCS – Choice Based Credit System
- CIA – Continuous Internal Assessment
- ESE – End of Semester Examinations

## UCH 5

### BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

**K1-Remember; K2-Understanding; K3-Apply; K4-Analyze; K5-Evaluate**

#### 1. Theory Examination - Part I, II & III

##### (i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	$10 \times 1 = 10$	MCQ	75
K2 Q11 to 15	B (Either or pattern)	$5 \times 5 = 25$	Short Answers	
K3 & K4 Q16 to 20	C (Either or pattern)	$5 \times 8 = 40$	Descriptive / Detailed	

##### (ii) CIA I & II and ESE: 55 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	$10 \times 1 = 10$	MCQ	55
K2 Q11 to 15	B (Either or pattern)	$5 \times 3 = 15$	Short Answers	
K3 & K4 Q16 to 20	C (Either or pattern)	$5 \times 6 = 30$	Descriptive / Detailed	

#### 2. Practical Examination

Knowledge Level	Section	Marks	Total
K3	Experiments	50	60
K4		Record Work	
K5			

#### 3. Project Viva Voce

Knowledge Level	Section	Marks	Total
K3	Project Report	60	80
K4		Viva voce	
K5			



## UCH 6

### Components of Continuous Internal Assessment

Components		Marks	Total
<b>Theory</b>	CIA 1	75	25
	CIA 2	75	
	Assignment/Seminar	5	
	Attendance	5	
<b>Practical</b>	CIA Practical	25	40
	Observation Notebook	10	
	Attendance	5	
<b>Project</b>	Review	15	20
	Regularity	5	

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH101		<b>Title: CORE CHEMISTRY PAPER – I INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I</b>		
Batch 2018-2019	Semester I	Hours / Week 6	Total Hours 90	Credits 5

### Course Objectives

1. To know the concept of qualitative inorganic analysis.
2. To acquaint knowledge about electron displacement effects, hybridization and conformations.
3. To know about the structure of an atom.

### Course Outcomes (CO)

K2	CO1	Explain the basic analytical knowledge and group separation of elements.
K2,K3	CO2	Understand and apply the nomenclature of inorganic and organic compounds.
K2, K3	CO3	Explain the isomerism of alkanes and cycloalkanes.
K2	CO4	Acquire the knowledge about the structure of atoms. Understand characteristics of gases.

### UNIT – I

#### Qualitative analysis

Introduction - Dry reactions – heating, flame tests; Wet reactions – test tubes, centrifuge tubes, stirring rods, droppers, reagent bottles and reagents, the centrifuge, washing the precipitates, wash bottles, transferring of precipitates, heating of solutions, evaporation, dissolving of precipitates, precipitation with hydrogen sulphide, cleaning of apparatus. Interfering anions and its elimination, classification of cations into analytical groups (group separation only), scheme of classification of anions. (18 hours)

### UNIT-II

#### Nomenclature of inorganic and organic compounds

Writing symbols of elements and formulae of inorganic species- inorganic nomenclature- names of compounds in general-names of ions – names of radicals –names of isopolyanions-names of hetero polyanions –names of acids – names of salts and salt like compounds –names of addition compounds –names of neutral hydrides –names of boron hydrides. Nomenclature of cations, anions, radicals, binary acids, oxy acids, peroxy acids salts, binary compounds, hydrates, double salts.

Nomenclature of organic compounds – Introduction, systems of naming organic compounds – Rules of IUPAC system of nomenclature for cyclic compounds , complex organic compounds – substituted alkanes, alkenes and alkynes, compounds having functional groups, polyfunctional compounds. (18hours)

**UNIT-III****Chemistry of alkanes and Cycloalkanes**

Structure – Nomenclature - Isomerism in alkanes – Natural source of alkanes – Methods of preparation – physical properties - chemical properties – Conformation study of ethane and n-butane.

**Cycloalkanes**

Nomenclature – methods of preparation – physical and chemical properties. Stability of cycloalkanes alkanes. Bayer strain theory. (18 hours)

**UNIT-IV****Structure of atom – Classical Mechanics and Wave mechanical approach**

Introduction of classical mechanics approach - Quantum Theory and Bohr Atom. Wave mechanical concept of atom – de Broglie's equation . Heisenberg's Uncertainty principle. Schrodinger's Wave equation. Charge cloud concept and orbitals. Quantum Numbers-Principal, Azimuthal, Magnetic and Spin Quantum Numbers and their significance. Pauli's Exclusion principle. Energy distribution and orbitals. Distribution of electrons in orbitals. Representation of ground state electronic configuration of elements – **\*Aufbau principle, n+l rule and Hund's rule.** (18 hours)

**UNIT-V****Gaseous state**

Characteristics of gases- parameters of a gas. Gas laws-Boyle's law, Charles's Law, Gay lussac's law and Avogadro's law. The ideal gas equation- kinetics of molecular theory of gases. Derivation of kinetic gas equation. Distribution of molecular velocities- calculation of molecular velocities. Collision properties. vander-waals equation – Liquefaction of gases – Law of corresponding states- Methods of liquefaction of gases. (18 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. G. Svehla, (1997) **Vogel's Text book of Macro and Semimicro Qualitative Analysis**, Longman Inc., Newyork.
2. R. D. Madan, (2004) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi.
3. M.K. Jain. S.C. Sharma, (2004) **Modern Organic Chemistry**, Vishal publishing Co., New Delhi .
4. B. R. Puri, L. R. Sharma, K. K. Kalia, (2014) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi.
5. Arun Bahl , B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand & Co., New Delhi, Revised multicolor edition.
6. Arun Bahl and B.S.Bahl, G.D.Tuli, (2012) **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi, Revised multicolor edition.

## UCH 9

### REFERENCE BOOKS

1. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madan, (2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
2. J. D. Lee, (2006) **Concise Inorganic Chemistry**, Black Well Science, UK.
3. M. K. Jain, S. C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi,.
4. S. Glasstone, D. Lewis, (2004) **Elements of Physical Chemistry**, Macmillan Ltd, London.

18UCH101

### MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	H
<b>CO2</b>	S	S	M	M	M
<b>CO3</b>	S	S	M	M	M
<b>CO4</b>	S	S	H	M	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

**SEMESTER I**  
**PART IV – ENVIRONMENTAL STUDIES**

**Total Credits: 2**

**Total Hours: 30**

**Objectives:**

- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good “ecocitizens” thereby catering to global environmental needs.

**UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT**

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources. (6 hours)

**UNIT II ECOSYSTEMS**

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem. (6 hours)

**UNIT III BIODIVERSITY AND ITS CONSERVATION**

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – insitu Conservation of Biodiversity – exsitu Conservation of Biodiversity. (6hours)

**UNIT IV ENVIRONMENTAL POLLUTION**

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide. (6 hours)

**UNIT V SOCIAL ISSUES AND THE ENVIRONMENT**

Sustainable Development – Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl

## UCH 11

– Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health. (6 hours)

**Self Study** (Questions may be asked from these topics also)

### **Text Book**

1.P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

### **Reference Books**

1.Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs.Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.

2.Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi -110 006.

3.J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001.

### **Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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### **Question Paper Pattern**

**(External only)**

**Duration: 3 hours**

**Total Marks : 50**

**Answer all Questions (5 x 10 = 50 Marks)**

Essay type, either or type questions from each unit.

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH202		<b>Title: CORE CHEMISTRY PAPER – II INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II</b>		
Batch 2018-2019	Semester II	Hours / Week 6	Total Hours 90	Credits 5

### Course Objectives

1. To Know about metallurgy and importance of periodic table.
2. To learn about aromatic compounds and Huckel's rule.
3. To study the fundamentals of thermodynamics and thermochemistry.

### Course Outcomes (CO)

K1, K3	CO1	Gain knowledge about metallurgy and periodic properties.
K1, K2	CO2	Understand the basic aspects of aromaticity.
K1, K3	CO3	Learn about concepts of thermodynamics.
K1, K4	CO4	Acquire the knowledge in thermochemistry.

## UNIT-I

### Principles and Processes of Metallurgy

\***Minerals – ores - occurrence of metals-classification of ores**-various steps involved in the metallurgical processes- concentration of ores by froth floatation-gravity separation - magnetic separation processes- calcination – roasting - smelting - alumino thermic process - purification of metals by electro refining - zone refining-van Arkel process - furnaces-different types. (18 hours)

## UNIT-II

### Periodic table and atomic properties

1. Long form periodic table – cause of periodicity – division of elements into s, p, d and f block elements.
2. Atomic properties: Sizes of atoms and ions - covalent radius, Vanderwaals radius and ionic radius. Ionization energy – factors determining ionization energy, variation of ionization energy in the periodic table. Electron affinity – variation of electron affinity in the periodic table. Electronegativity – pauling's approach, Allred and Rochow's approach, Mullikens approach, factors influencing electronegativity, applications of electronegativity. (18 hours)

## UNIT-III

### Benzene and Aromaticity

#### Nomenclature

Naming of monosubstituted Benzene, disubstituted benzene and polysubstituted benzene.

**Aromaticity** The concept of Aromaticity, Aromatic, anti aromatic, and non aromatic compounds, Huckel's rule (Applications not needed).

Toluene, cumene and styrene – Preparation, Physical and Chemical properties. (18 hours)

**UNIT-IV****Thermodynamics - I**

Basic concepts - scope and limitations - Thermodynamic terms - intensive and extensive properties- state, equilibrium - processes-nature of heat and work – pressure – volume work - isothermal reversible and irreversible expansion works of an ideal gas - maximum work - Zeroth law of thermodynamics - Internal Energy and First law of thermodynamics - Enthalpy of a system-Relation between  $\Delta E$  and  $\Delta H$ -Relation between  $C_p$  and  $C_v$  – Joule Thomson effect -comparison between adiabatic and isothermal expansions - Adiabatic expansion of an ideal gas -work done in adiabatic reversible expansion. (18 hours)

**UNIT-V****Thermochemistry**

Introduction - exothermic and endothermic reactions - Thermo chemical equations - Kirchoff's equation - types of heat of reaction - heat of formation - standard heat of formation - standard heat of reaction - heat of combustion-heat of solution - heat of neutralization-heat of fusion - heat of vaporization - heat of sublimation and heat of transition – definition - simple problems. Hess's law of constant heat summation – applications - bond energy and strength of bond - experimental determination of heat of combustion - bomb calorimeter.

(18 hours)

*\*self study portion***Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. Puri B.R, Sharma L.R, Kalia K.C., (2014) **Principles of Inorganic Chemistry**, MILESTONE publishers and Distributors, New Delhi.
2. Sathya praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi.
4. B.S. Bahl, and Arun Bahl, (2012) **Advanced Organic Chemistry**, S.Chand andCo, New Delhi, Revised multicolor edition.
5. B.S. Bahl and G. D. Tuli, and Arun Bahl, (2012) **Essentials of Physical Chemistry**, S. Chand publishing, Revised multicolor edition.

**REFERENCE BOOKS**

1. R. D. Madan, (2011) **Modern Inorganic Chemistry**, S.Chand and Co., Third Revised Edition.
2. R. Gopalan, (2009) **Inorganic Chemistry For Undergraduate**, Universities Press (India) Private Limited, Hyderabad.
3. Puri B. R. Sharma L. R., M. S. Pathania, (2013) **Principles of Physical Chemistry**, Vishal Publishing Co., New Delhi.



## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	H	H
<b>CO2</b>	S	S	M	M	M
<b>CO3</b>	S	S	H	H	M
<b>CO4</b>	S	S	H	H	M

**S** – Strong**H** – High**M** – Medium**L** – Low

**SEMESTER-II**

**PART-IV VALUE EDUCATION: MORAL AND ETHICS**

**Total Hours : 30**

**Total Credits: 2**

**OBJECTIVES:**

- To impart the value education in every walk of life.
- To make them understand the relationship between Moral and Ethics.
- To impart the right attitude by practicing self introspection.
- To make them realize about their hidden power within them.
- To develop a knowledge for the steps of upliftment.
- To know about their goal of life.
- To make them understand the importance of yoga and meditation.
- To realize what is the real peace.
- To understand what are the ways to contribute peace to the whole world.
- To goad youth to reach excellence and reap success.

**UNIT I:**

**6hrs**

Introduction – Meaning of Moral and Ethics – Ethics and Culture – Aim of Education.

**UNIT II:**

**6hrs**

Swami Vivekananda – A Biography.

**UNIT III:**

**6hrs**

The Parliament of Religions – Teachings of Swami Vivekananda.

**UNIT IV:**

**6hrs**

Steps for Human Excellence.

**UNIT V:**

**6hrs**

Yoga & Meditation.

**Text Book**

Value Base Education – Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), First Edition, 2015.

**Reference Book**

Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication, 2000.

**Question paper pattern**

**(External only)**

**Duration: 3 hrs**

**Total Marks: 50**

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH2CL		<b>Title:</b> CORE CHEMISTRY PRACTICAL – I INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS		
Batch 2018-2019	Semester I & II	Hours / Week 3	Total Hours 90	Credits 2

### Course Objectives

1. To demonstrate the basic laboratory technique of semimicro qualitative analysis.
2. To understand about the interfering anions, its elimination and group separation.
3. To prepare inorganic complexes.

### Course Outcomes (CO)

K1,K2	CO1	Build the knowledge in principles of semi micro qualitative analysis.
K2	CO2	Know about the interfering and non interfering anions.
K2, K4	CO3	Experience to remove interfering anion and group separation of various cations.
K2, K3	CO4	Learn the preparation of inorganic complexes.

### I Semi - Micro Qualitative Analysis

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semi-micro methods using the conventional scheme with Hydrogen Sulphide may be adopted.

### II. Preparation of Inorganic Complexes.

1. Tetraamminecopper(II) sulphate
2. Potassiumtrioxalatochromate(III)
3. Iron(III) hexacyanoferrate(II)
4. Hexamminecobalt(II) chloride
5. Hexathiourealead(II) nitrate
6. Tristhioureacopper(I) sulphate

### TEXT BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu . A.R, (1997), **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons,

### BOOKS FOR REFERENCE

1. G. Svehla, (1987) ,**Vogel's Qualitative Inorganic Analysis**, Orient Longman Ltd, Hyderabad.

## UCH 18

**Time: 3 hours**

**Max. Marks : 60**

### Distribution of Total Marks: 60

Record	10 marks
Analysis	40 marks
Preparation	10 marks

### Distribution of Analysis Marks: 40

Four ions with correct Procedure	40 marks
Three ions with correct Procedure	30 marks
Two ions with correct Procedure	25 marks
One ions with correct Procedure	12 marks

- ❖ Spotting of an ion -5 marks
- ❖ Precipitation- 5marks
- ❖ Correct detection of cations without eliminating the interfering ion should be treated as spotting
- ❖ At least one confirmatory test for each ion is expected. If no confirmatory test is reported deduct 3 marks
- ❖ The candidate may be asked to leave a small portion of the given mixture so that the examiners may confirm the presence of an ion if any discrepancies arise.
- ❖ **Anions to be given:** Sulphate, Chloride, Bromide, Fluoride, Borate, Nitrate, Carbonate, Oxalate, and Phosphate.
- ❖ **Cations to be given:** Lead, Bismuth, Copper, Manganese, Aluminium, Ferrous, Ferric, Cadmium, Cobalt, Nickel, Zinc, Barium, Calcium, Strontium, Magnesium and Ammonium.

**18UCH2CL**

### MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	M
CO2	S	S	H	M	M
CO3	S	S	H	M	M
CO4	S	S	S	M	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH303		<b>Title: CORE CHEMISTRY PAPER – III INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - III</b>		
Batch 2018-2019	Semester III	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To know the basic concepts in quantitative analysis.
2. To observe the chemistry of dicarboxylic acids and reactions involving carbonyl compounds.
3. To enumerate second law of thermodynamics, state functions S, A, G and chemical equilibrium.

### Course Outcomes (CO)

K2, K3	CO1	Gain knowledge in preparation, standardization of solution and principles of volumetric analysis.
K1, K2	CO2	Study the preparation, properties and reactions of dicarboxylic acids, unsaturated acids and hydroxy acids.
K1, K2	CO3	Study on the preparation and properties of aldehydes and ketones.
K3, K4	CO4	Analyze and apply laws of thermodynamics and thermodynamic properties.

### UNIT-I

#### Quantitative Analysis

1. The mole concept – atomic, molecular and molar masses. Equivalent mass – Equivalent mass of an acid, equivalent mass of a base, equivalent mass of oxidizing and reducing agents.
2. concentration terms – Normality, molarity, mole fraction, molality, percentage solution – weight composition, volume composition.
3. Principles of volumetric analysis – standard solution (primary and secondary standards) titration – types (acid, base, oxidation, reduction), equivalent point, end point, indicators – action of phenolphthalein and methyl orange, caution in volumetric titrimetry – precautions to avoid errors in titrimetric analysis, corrections for unavoidable errors. (12 hours)

### UNIT-II

#### Dicarboxylic acids

Preparation, physical and chemical properties and uses of Oxalic, Malonic, Succinic, Glutaric and Adipic acids. Preparation, physical and chemical properties and Geometrical isomerism of Maleic acid and Fumaric acid. Malonic ester and Acetoacetic ester - synthetic applications. Tautomerism of Acetoacetic ester. (12 hours)

**UNIT-III****Aldehydes and ketones**

General methods of preparations and properties - Nucleophilic addition of Grignard reagents, aldol condensation, Perkin, Knoevenagel, Claisen, Reformatsky reaction, reactions with  $\text{LiAlH}_4$  and  $\text{NaBH}_4$ , WolfKishner, Meerwein-Ponndorf-Verley reductions and Cannizzaro reactions. (12 hours)

**UNIT-IV Thermodynamics-II**

Limitations of First law – need for second law. Various statements of second law. Spontaneous or irreversible processes. Criteria of spontaneity - Cyclic process- Entropy – definition - numerical definition. The Carnot's cycle- thermodynamic efficiency. Derivation of entropy from Carnot's cycle. Physical significance of entropy- Entropy change in isothermal expansion of an ideal gas, entropy change in reversible and irreversible processes, entropy change accompanying change of phase. Entropy as the function of P, V and T. Some other state functions-Work and Free energy functions - Gibb's free energy (G) and Helmholtz free energy (A)- variation of free energy with temperature and pressure. Isothermal change in free energy - Gibbs-Helmholtz equations. The Clapeyron Equation-Clausius – Clapeyron equation-its applications. Significance of  $\Delta A$  and  $\Delta G$ . van't Hoff isotherm –van't Hoff isochore. Fugacity and activity. (12 hours)

**UNIT-V Thermodynamics-III**

Partial molal properties: Concept of chemical potential- Physical significance-The Gibbs – Duhem equation-variation of chemical potential with T and P- Time's Arrow . Need for third law of thermodynamics – Nernst heat theorem- Third law of thermodynamics. Determination of absolute entropy of solids, liquids and gases. Standard absolute entropies ( $S^\circ$ ). Entropy change in chemical reactions. Unattainability of absolute zero. Derivation of Boltzmann entropy equation. Residual entropy. (12 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

**TEXT BOOKS**

1. R. D. Madan, (2013) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi.
2. B. R. Puri, L. R. Sharma, K. K. Kalia, (2008) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi.
3. Arun Bahl, B. S. Bahl, (2010) **Advanced Organic Chemistry**, S. Chand & Co., New Delhi.
4. Arun Bahl and B. S. Bahl, G. D. Tuli, (2009) **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi.
5. B. R. Puri, L. R. Sharma, M. S. Pathania, (2009) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.

## UCH 21

### REFERENCE BOOKS

1. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madan, (2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
2. J. D. Lee, (2006) **Concise Inorganic Chemistry**, Black Well Science, UK.
3. M. K. Jain, S. C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi.
4. B. Mehta, Manju Mehta, (2005) **Organic Chemistry**, Prentice Hall of India Pvt Ltd., New Delhi.
5. S. Glasstone, D. Lewis, (2004) **Elements of Physical Chemistry**, Macmillan Ltd, London.

18UCH303

### MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	M	H
<b>CO2</b>	S	S	S	H	H
<b>CO3</b>	S	S	S	H	H
<b>CO4</b>	S	S	H	H	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low



**Part IV – III Semester**

**Skill Based Subject I – GENERAL AWARENESS (ONLINE)**  
(2014 – 2015 Batch Onwards)

**Total Credits: 3**

**Total Hours : 30**

**Objectives:**

- **To acquire knowledge in relation to various competitive examinations.**
- **To create awareness about an online examination which is being followed in competitive examinations.**

**UNIT I (6 hours)**

**1. Tamil and other Literatures**

Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

**2. Economics and Commerce**

Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

**3. Social studies**

Indian History – Inventions – Indian Poetry – Constitution - Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

**UNIT II (6 hours)**

**4. Numerical Aptitude**

Objective Arithmetic : Number systems – probability – HCF and LCM of numbers - decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, volume and surface area.

**5. Verbal Aptitude**

Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

**6. Abstract Reasoning**

Logic Reasoning : Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

## UCH 23

Non – verbal Reasoning : Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

### UNIT III (6 hours)

#### 7. **General Science and Technology**

**SCIENCE** - Basic principles and concepts in Physics, Chemistry, Botany and Zoology.

**TECHNOLOGY** - Metallurgy, instrumentation, discoveries and inventions of techniques.

#### 8. **Computer Science**

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.

#### 9. **Education**

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis – Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counselling.

### UNIT IV (6 hours)

#### 10. **Library and Information Science**

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

#### 11. **Sports and Games**

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

#### 12. **Current Affairs**

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

### UNIT V (6 hours)

#### 13. **National Cadet Corps (NCC)**

Introduction to the Armed Forces (Army, Navy, Air Force) – Drill – Weapon Training – Map Reading – Civil Defence.

14. **National Service Scheme (NSS)**

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrative setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

15. **Youth Red Cross (YRC)**

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

**Text Book**

1. General Awareness, Question Bank, Kongunadu Arts and Science College, Coimbatore, First Edition 2014.
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**UCH 25**

**Question Paper Pattern**

**Max. Marks 100**

**End of Semester Examination (ESE)- On-Line Examination** **75 Marks**

1. 150 questions are to be given. Each question carries ½ mark.
2. In each unit, 30 questions are to be given, covering all the 5 units.

**Continuous Internal Assessment (CIA) (through On-Line)** **25 Marks**

- a) Two Exams. 15 Marks
- b) Assignment\*\* 5 Marks
- c) Attendance 5 Marks

\*\* Each student has to submit an assignment in the Current Affairs area.

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH404		<b>Title: CORE CHEMISTRY PAPER – IV INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - IV</b>		
Batch 2018-2019	Semester IV	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To learn group IA elements.
2. To know about preparation and properties of phenols, amines and diazo compounds.
3. To study phase equilibrium- one and two component systems and solutions.

### Course Outcomes (CO)

K2, K3	CO1	Gain the knowledge about the properties of alkali metals.
K1, K2	CO2	Understand the basic aspects of phenols, amines and its derivatives.
K1, K2	CO3	Analyze and apply phase rule to various systems.
K3, K4	CO4	Understand colligative properties and their determinations.

### UNIT-I

#### Group IA elements - Alkali metals

**\*General properties-electronic configuration, density, molar volume, atomic volume, atomic and ionic radii, heat of atomization, melting and boiling point- ionization energy- electropositive character. Similarities in chemical properties – formation of halides, nitrates, oxides, hydroxides, hydrides. Comparison of Lithium with other members of the family. Anomalous behavior of lithium- diagonal relationship of Li and Mg - Lithium- Extraction, properties and uses.** (12 hours)

### UNIT-II

#### Phenols

Monohydric Phenols - preparation and properties, acidity of phenols, reaction of monohydric phenols - Esterification, Nitration, Sulphonation, Halogenation, coupling with diazonium salts, Kolbe-Schimit, Reimer-Tiemann, Schotten-Baumann, Hoesch-Houben reaction and Gattermann reactions with mechanism. Preparation and properties of Alpha and Beta-naphthols. (12 hours)

### UNIT-III

#### Amines and Diazo compounds

Preparation and reactions of amines, separation of a mixture of primary, secondary and tertiary amines – comparison of their basicity. Ring substitution, Diazotization and coupling reaction of aromatic amines.

Preparation, structure and their synthetic applications of Diazomethane and Diazoacetic ester. (12 hours)

**UNIT-IV****Phase rule and Phase equilibria**

Phase rule-statement- Definition of terms phase, component, and degrees of freedom. Derivation of Gibb's Phase rule. Application to One component systems- Phase diagrams - Water, Carbon dioxide and Sulphur systems. Polymorphism-Experimental determination of transition point.

Two components system: Simple Eutectic systems - Silver-Lead and Zinc - Cadmium system. Formation of compounds with congruent and incongruent melting point (Ferric chloride - water system and Sodium sulfate - water system). Solid gas equilibria.

(12 hours)

**UNIT-V****Solutions**

Introduction- Solution of Gases in Gases-Henry's law-limitations of Henry's law. Solutions of liquids in liquids-solubility of partially miscible liquids. Phenol-water system. Solutions of solids in liquids-solubility- its equilibrium concept.

Dilute Solutions- Colligative properties- lowering of vapour pressure - Raoult's Law - derivation. Ideal solutions and deviations from Raoult's law. Determination of molecular mass from vapour pressure lowering. Elevation of Boiling point relation and determination of molecular mass. Depression of freezing point and determination of molecular mass from depression of freezing point. Measurement of freezing point depression -Rast's Camphor method.

Osmosis - Semipermeable membrane - silica garden and the egg experiment. Osmotic pressure- Determination of osmotic pressure by modern osmometer - isotonic solutions- Reverse osmosis.

(12 hours)

*\*self study portion***Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. R. D. Madhan, (2012) **Modern Inorganic Chemistry**, S. Chand and Co.
2. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
3. Arun Bahl and B.S. Bahl, (2010) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
4. B. R. Puri, L.R. Sharma, and S. Pathania, (2008) **Principles of Physical Chemistry**, Shoban Lal Nagin Chand & Co, New Delhi.

**REFERENCE BOOKS**

1. Lee J.D., (2007) **Concise Inorganic Chemistry**, Black Well Science-Wiley – India, New Delhi.
2. B.Mehta, Manju Mehta, (2005) **Organic Chemistry**, Prentice Hall of India Private Limited, New Delhi.
3. Arun Bahl, B.S. Bahl, G.D.Tuli., (2009) **Essentials of Physical Chemistry** S. Chand and company, New Delhi.

**18UCH404****MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	M	M	M
<b>CO2</b>	S	S	M	M	M
<b>CO3</b>	S	S	M	M	M
<b>CO4</b>	S	S	H	H	M

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH4S2		<b>Title: SKILL BASED SUBJECT-II WATER CHEMISTRY</b>		
Batch 2018-2019	Semester IV	Hours / Week 2	Total Hours 30	Credits 3

### Course Objectives

1. To know about the sources and characteristics of water.
2. To learn about the analysis of the pollutants in water.
3. To learn the methods of purification and management of water.

### Course Outcomes (CO)

K1	CO1	Understand the importance of water.
K2	CO2	Studying the different types of water pollution.
K4	CO3	Analyze and measurement of toxic chemical substances.
K2	CO4	Gain the knowledge of purification and management of water.

### UNIT-I

#### Sources of water

Introduction- Sources of water - uses of water - water for industry. Quality of natural waters - Chemistry of water - Water in human body - Water as a solvent - main quality characteristics of water - effects of water on rocks and minerals - organic matter in water - humic material in water - colloidal material in water. (6 hours)

### Unit-II

#### Water pollution

**\*Definition - water pollutants - types of water pollution - ground water pollution, surface water pollution,** lake water pollution, river water pollution and sea water pollution - physical pollution of water - chemical pollution of water - biological pollution of water - physiological pollution of water. (6hours)

### Unit- III

#### Analysis of a water pollutants

Measurement of water quality by chemical and physical examination of water - Chemical substances affecting potability - electrical conductivity - suspended solids - dissolved solids - alkalinity - measurement of toxic chemical substances - general analytical methods of determination of metals (Iron and chromium) - international standards for drinking water - dissolved oxygen - biochemical oxygen demand - chemical oxygen demand. (6 hours)



**Unit- IV**

**Purification of water**

Removal of coarse, dispersed and colloidal impurities from water - Coagulation of water - Contact and electrochemical coagulation - Flocculants - Sterilisation and disinfection of water - Chemical methods of sterilisation - Physical methods of sterilization. Desalination of brackish water - Reverse osmosis.

Zeolite process - Ion exchange method - Demineralization of water - Determination of hardness of water - EDTA method. (6 hours)

**Unit-V**

**Water management**

Introduction - Water management - Use and conservation of water resources - Water quality management - Rain water harvesting - Water from rocks - Water management in agriculture - Rain fed system - Irrigated systems - Sea water for agriculture - Water management in industries. (6 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

**TEXT BOOK**

1. B.K Sharma, (2003) **Water pollution**, Goel publishing House, Meerut.
2. A. K. Dee ,(2017) **Environmental chemistry**, New age international.

**REFFRENCES**

1. Jain and Jain, (2001) **Engineering Chemistry**, Dhanpat Rai Publishing Co.,
2. N. Manivasakam (Water Analyst),(2001) **Chemical and Microbiological Analysis of Mineral Water and Packaged Drinking Water**, Principal Public Health Laboratory, Coimbatore.

**18UCH4S2**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	M	H	M	S
<b>CO2</b>	M	S	S	S	S
<b>CO3</b>	H	S	M	S	S
<b>CO4</b>	M	S	S	M	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH4CM		<b>Title:</b> CORECHEMISTRY PRACTICAL – II INORGANIC VOLUMETRIC AND ORGANIC QUALITATIVE ANALYSIS		
Batch 2018-2019	Semester III & IV	Hours / Week 3	Total Hours 90	Credits 3

### Course Objectives

1. To demonstrate the concept of quantitative volumetric analysis.
2. To understand the various types of titrimetric analysis.
3. To identify the functional groups of unknown organic compounds.

### Course Outcomes (CO)

K1,K2	CO1	Gain the knowledge in principles of volumetric analysis.
K2	CO2	Estimating the amount of substances present in solutions.
K2, K4	CO3	Learn to approach a problem systematically and to interpret the results logically.
K2, K3	CO4	Detect various functional groups present in an organic compound.

## I. Titrimetric Quantitative Analysis

### a. Acidimetry and Alkalimetry:

1. Estimation of HCl by NaOH using a standard Oxalic acid solution  
2. Estimation of Na<sub>2</sub>CO<sub>3</sub> by HCl using a standard Na<sub>2</sub>CO<sub>3</sub> Solution.

### b. Permanganometry:

1. Estimation of Oxalic acid by KMnO<sub>4</sub> using a standard Oxalic acid solution  
2. Estimation of Iron(II) Sulphate by KMnO<sub>4</sub> using a standard Mohr's Salt solution  
3. Estimation of Calcium(II) by KMnO<sub>4</sub> using standard oxalic acid solution

### c. Dichrometry:

1. Estimation of Iron (II) by potassium dichromate using standard Mohr's salt solution

### d. Iodometry:

1. Estimation of KMnO<sub>4</sub> by Thio using a standard Potassium dichromate Solution  
2. Estimation of Copper (II) Sulphate by K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.

## II. Organic analysis

### Analysis of organic compounds

1. Preliminary tests
2. Detection of elements present
3. Aromatic or Aliphatic
4. Saturated or Unsaturated
5. Nature of the functional group
6. Confirmatory tests and Preparation of derivatives for the functional groups.

**The following functional group compounds may be given:**

Aldehydes, Ketones, Amines, Amides, Diamide, Carbohydrates, Phenols, Acids, Esters and Nitro compounds.

**BOOKS FOR REFERENCE**

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, NewDelhi, Sultan Chand and Sons.
2. Mendham. J, Denney. R.C, Barnes. J.D, and Thomas, M. (1989) **Vogel's Text book of Quantitative Analysis**, Pearson Education.
3. Gopalan. R, Subramaniam. P.S, and Rengarajan. K, (2004) **Elements of Analytical Chemistry**, Sultan Chand and Sons.

**Time: 6 hours**

**Max. Marks : 60**

**Distribution of Total Marks- 60**

Record	10 marks
Practical	50 marks

**Distribution of Practical Marks-50**

Volumetric	25
Organic Analysis	25

**Distribution of Volumetric Analysis Marks-25**

Procedure (To be written within five minutes)	5
Experiment	20
Error up to <2 %	20
2 – 3 %	15
3 - 4 %	10
>4 %	5

**Distribution of Organic Analysis – 25 Marks**

Preliminary Tests	5
Aliphatic or Aromatic	3
Saturated or Unsaturated	3
Special elements	6
Functional group	5
Derivative	3

### UCH 33

- **Substance to be given for organic analysis:** Cinnamic acid, Benzoic acid, Succinic acid, Aniline, Benzamide, Urea, Benzaldehyde, Acetophenone, Phenol, Cresols, Glucose, Toluidine, Nitrobenzene.

18UCH4CM

### MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	S	H
<b>CO2</b>	S	S	H	H	M
<b>CO3</b>	S	S	H	H	H
<b>CO4</b>	S	S	H	S	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH505		<b>Title: CORE CHEMISTRY PAPER – V SPECTROSCOPY AND CHROMATOGRAPHIC TECHNIQUES</b>		
Batch 2018-2019	Semester V	Hours / Week 3	Total Hours 45	Credits 3

### Course Objectives

1. To know about the region of electromagnetic spectrum, fundamentals of ultra – violet visible spectroscopy and Infrared spectroscopy.
2. To study Nuclear Magnetic Resonance (NMR) spectroscopy and Mass spectrometry and to interpret and solve problems using various spectra.
3. To have insight about Chromatographic techniques.

### Course Outcomes (CO)

K1,K2	CO1	Understand the basic principles, instrumentation of UV-Visible spectroscopy and to utilize their basic aspects to identify various organic compounds.
K2	CO2	Gain the knowledge in principles, instrumentation and functions of IR spectroscopy.
K2, K4	CO3	Study the basic principles and instrumentation of NMR spectroscopy and apply to identify the organic compounds.
K2, K3	CO4	Know about basic principles and instrumentation of mass spectroscopy technique and the application of various spectral techniques to elucidate the structure of organic molecules. Exploring the various chromatography techniques and their applications in separation of organic mixtures.

### UNIT-I

#### Ultra – violet and visible spectroscopy

**\*Electromagnetic spectrum and absorption of radiations**, Principle of ultraviolet spectroscopy, the absorption laws- Lambert's law and Beer's law. Selection rules, instrumentation – Block Diagram, theory of electronic spectroscopy, types of electronic transitions, the chromophoric concept, auxochromes, absorption and intensity shifts – bathochromic, hypsochromic hyperchromic and hypochromic shifts. Types of absorption bands, solvent effects, Frank – Condon principle. (9 hours)

### UNIT-II

#### Infrared spectroscopy

Fundamental concepts of Infrared spectroscopy, molecular vibrations, vibrational frequency, number of fundamental vibrations, selection rules, factors influencing vibrational frequency – coupled vibrations and Fermi resonance, electronic effects, hydrogen bonding and bond angles. Scanning of infrared spectrum (instrumentation), finger print region. (9 hours)

**UNIT – III****Nuclear Magnetic Resonance (NMR) spectroscopy**

Introduction, conditions of resonance, Solvents used in NMR, relaxation process – spin – spin relaxation, spin – lattice relaxation and quadrupole relaxation. Number of signals, instrumentation, positions of signals (chemical shift), shielding and deshielding effects, factors influencing chemical shift – inductive effect, vander-Waal's deshielding, Anisotropy. Peak area and proton coupling, diamagnetic shielding in benzene, splitting of the signals in pure ethanol and chloroethane. (9 hours)

**UNIT – IV****Mass spectrometry and application of spectroscopic methods**

Basic principles, theory of mass spectrometry, meta stable ions or peaks, nitrogen rule, general fragmentation modes of hydrocarbons, Retro – Diels Alder reaction, hydrogen transfer rearrangements and McLafferty rearrangement.

IR, NMR and Mass techniques in the identification of simple organic molecules. (Ethanol and dimethyl ether, acetaldehyde and acetone, ethylene and acetylene). (9 hours)

**UNIT – V****Chromatography**

Introduction, definition, types, thin layer chromatography – experimental techniques - coating materials - preparation of thin layer in plates – activation of adsorbents – purification of silica gel – sample application – development tank – solvent systems – plate development – detection of components, evaluation of chromatography. Column chromatography – principle, experimental techniques – apparatus – adsorbents – preparation of adsorption columns – solvents used in successive elution – gradient elution. (9 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. Y.R, Sharma, (2007) **Elementary Organic Spectroscopy Principles and Chemical Applications**, S.Chand & Company Ltd, New Delhi.
2. Jag Mohan, (2013) **Organic Spectroscopy – Principles and Applications**, Narosa publishing house.
3. Gurdeep R. Chatwal, (2002) **Instrumental Methods of Chemical Analysis**, Himalaya publishing house, Delhi.

**REFERENCE BOOKS**

1. P.S. Sindhu, Elements of (2007) **Molecular Spectroscopy**, New Age International Publishers, New Delhi.
2. H.S. Randhana, (2003) **Modern Molecular Spectroscopy**, Macmillan India Ltd, New Delhi.

18UCH505

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	H	M
<b>CO2</b>	S	S	M	M	M
<b>CO3</b>	S	S	H	M	H
<b>CO4</b>	S	S	S	H	H

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH506		<b>Title:</b> CORE CHEMISTRY PAPER – VI <b>INORGANIC CHEMISTRY-I</b>		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To understand the theories of bonding in complexes.
2. To gain deep knowledge about nuclear reactions.
3. To have an idea about acids, bases and solids.

### Course Outcomes (CO)

K2	CO1	Understand the theories of co-ordination compounds.
K4, K2	CO2	Analyze the importance radioactive isotopes.
K1, K4	CO3	Remember nuclear fission and fusion.
K2, K4	CO4	Understand different concepts of acids, bases and solvents

### UNIT – I

#### Co-ordination Compounds

Co-ordination Compounds – Nomenclature - Werner's coordination theory- Electronic interpretation of coordinate bond by Sidgwick. Isomerism: Examples of geometrical isomerism in square planar and octahedral coordination compounds. Magnetic properties of coordination compounds and their interpretation by Pauling's Valence Bond Theory and Crystal Field Theory. (12 hours)

### UNIT - II

#### Nuclear Chemistry - I

Introduction – Nuclear stability and n/p ratio. Magic numbers. Packing fraction. Mass defect and binding energies. Definition for isotopes, isobars and isotones. Detection of isotopes - mass spectrographs-Thomson's, Dempster's and Aston's mass spectrographs- Importance of discovery of isotopes. Radioactivity –emission of alpha, beta and gamma rays. Radioactive disintegration -first order kinetics - half-life period. Radioactive disintegration series. Uses of radioactive isotopes – medicine – agriculture – C<sup>14</sup> dating – dating of Universe. (12 hours)

### UNIT - III

#### Nuclear Chemistry - II

Nuclear reactions – fission, fusion, spallation, capture and particle-particle reactions - nuclear fission-nuclear reactors- Atom bomb- nuclear fusion - Stellar energy- Hydrogen bomb. Artificial transmutation of elements. Artificial radioactivity. \*Atomic power projects in India- Disposal of nuclear wastes. Problems. (12 hours)



**UNIT - IV****Acids and Bases**

Different concepts of acids and bases- Arrhenius, Lowry- Bronsted, Lewis, Cady- Esley (solvent system), Lux-Flood and Usanovichs concepts. Conjugate acids and bases- comparison of strengths of Lowry-Bronsted acids - Comparison of strengths of Lewis acids and bases. Levelling effect and levelling solvents. Hard and soft acids and bases (HSABs)- Acid and bases strengths of HSABs- Applications of HSABs concept, Basis of hardness and softness - pi-bonding contributions- electro negativity factor. Limitations of HSAB concept.

(12 hours)

**UNIT - V****Solvents**

Solubilities of compounds- effect of temperature on solubility- chemical structure and solubility. Role of water as solvent. Classification of solvents - properties of ionizing solvents. Types of reactions in solvents. Specific non-aqueous solvents - protic solvents (ammonia) - aprotic solvents (SO<sub>2</sub>). Molten salts as solvents.

(12 hours)

*\*self study portion***Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. R. D. Madhan, G. D. Tuli, and S. M. Malik, (2006) **Selected Topics in Inorganic Chemistry**, S. Chand & Co., New Delhi,
2. B. R. Puri, L. R. Sharma, K. K. Kalia, (2008) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi
3. R. D. Madan, (2004) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi
4. U. N. Dash, (2010) **Nuclear Chemistry**, S. Chand & Co., New Delhi

**REFERENCE BOOKS**

1. Karen C. Timberlake, (2005) **Basic Chemistry**, Los Angeles Valley College, Pearson-Benjamin Cummings, San Francisco, First Edition.
2. G. S. Manku, (2006) **Theoretical Principles of Inorganic Chemistry**, Mc - Graw Hill Edition.
3. M. G. Arora, M. Singh, (1998) **Nuclear Chemistry**, Anmol publications Pvt. Ltd., New Delhi.
4. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
5. H. J. Arnikar, (2014) **Essentials of Nuclear Chemistry**, New Age International.

MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	H
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	S	M	S	M	S
<b>CO4</b>	S	S	S	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH507		<b>Title:</b> CORE CHEMISTRY PAPER – VII <b>ORGANIC CHEMISTRY - I</b>		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To study asymmetry and optical activity of organic molecules and basics in carbohydrate.
2. To understand the mechanisms of important organic rearrangements and chemistry of amino acids, proteins and peptides .
3. To study preparation and properties of heterocyclic compounds

### Course Outcomes (CO)

K1,K2	CO1	Understanding the fundamental aspects of stereochemistry.
K1,K2	CO2	Learn about preparation, properties and structural elucidation of carbohydrates.
K2, K4	CO3	Study on the various naming reactions and their detailed mechanistic pathway.
K1, K3	CO4	Acquire the knowledge of preparation, synthesis and properties of amino acids, proteins, peptides and heterocyclic compounds.

### UNIT-I

#### Stereochemistry

\***Optical Isomerism**, cause of optical activity, plane polarized light, specific rotation, asymmetric carbon atom, chirality, Optical isomerism of lactic acid and tartaric acid. Enantiomers and diastereo isomers. Resolution of Racemic mixture – mechanical separation – kinetic separation – selective adsorption – chemical method – biochemical method. Racemization, Asymmetric synthesis, Walden inversion. Specifying absolute configuration – R , S system for asymmetric molecule. Optical activity of Biphenyl, Allenes, Spiranes and over crowded molecules. (12 hours)

### UNIT-II

**Carbohydrates** - Introduction, classification, Monosaccharides - occurrence, preparation, structural elucidation, properties and uses of Glucose and Fructose. Cyclic form of glucose and fructose. Mutarotation, interconversion of glucose to fructose and vice versa. Disaccharides – Structure, preparation, properties and uses of sucrose and maltose. Polysaccharides – starch and cellulose - Manufacture, structure and properties. Derivatives of cellulose. (12 hours)

### UNIT-III

#### Molecular Rearrangements with mechanism

Reaction, mechanism, evidences and applications of molecular rearrangement reactions - Pinacol-Pinacolone, Beckmann, Hoffmann, Curtius, Benzilic acid and Claisen Rearrangements. (12 hours)

### UNIT-IV

#### Amino acids , Proteins and peptides.

1. Amino acids – Nomenclature, dipolar nature of amino acids, isoelectric point, methods of preparation – amination of halo acids – Strecker synthesis – Gabrielphthalimide synthesis – Koop synthesis. Physical and chemical properties of amino acids. N-terminal and C-terminal amino acid residues.
2. Proteins, classification – according to chemical composition. Structure of proteins – primary – secondary and tertiary structure. General properties of proteins. Denature of proteins. Colour test for proteins.
3. Nomenclature of peptides – determination of structure of peptides – end group analysis – synthesis of peptides. (12 hours)

### UNIT-V

#### Heterocyclic compounds

Introduction- preparation – physical and chemical properties of Furan, Pyrrole, Thiophene, Pyridine, Quinoline and Isoquinoline. (12 hours)

*\*self study portion*

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOKS

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
2. Gurdeep. R. Chatwal, (2013) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi.
3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi.

#### REFERENCE BOOKS

1. M.G Arora, (2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi.
2. Jagdamba Singh and Yadav, (2005) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers.
3. I.L.Finar,( 2009) **Organic Chemistry**,Vol.I and II, Addison-Wesley Longman.

**UCH 42**

**MAPPING**

**18UCH507**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	S	M	M
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	M	M
<b>CO4</b>	S	M	S	M	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH508		<b>Title:</b> CORE CHEMISTRY PAPER - VIII PHYSICAL CHEMISTRY - I		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To understand the fundamentals of electrochemistry.
2. To know the types and importance of electrodes and electro chemical cells.
3. To study about corrosion, polarography and surface chemistry.

### Course Outcomes (CO)

K1,K4	CO1	Understanding the concept of conductance and its applications.
K2	CO2	Acquire basic knowledge about electrode potential, electrochemical cell and potentiometric titrations.
K2, K4	CO3	Understanding the fundamental principles of fuel cells, corrosion and its significance.
K2, K3	CO4	Know about basic principles and instrumentation of Polarography and its applications. Gain knowledge about surface chemistry.

## UNIT-I

### Fundamentals of Electrochemistry

Introduction-Classification of conductors – Electrolytic conductance-conductivity cell measurement of conductance of solutions – Variation of equivalent conductance with dilutions. Migrations of ions - Transport number – determination by moving boundary method and Hittorf's method – Kohlrausch's law – statement - application. Arrhenius theory of electrolytic dissociation - Ostwald's dilution law and limitations - theory of strong electrolytes: Debye-Huckel – Onsagar theory (elementary treatment only) - Debye – Falkenhagen effect and Wien effect. Applications of conductance measurements: (i) Determination of dissociation constant of a weak organic acid (i) Conductometric titrations – acid-base titration, precipitation titration. (iii) Determination of solubility product of sparingly soluble salt (iv).Determination of ionic product of water. (12 hours)

## UNIT - II

### Electro Chemical Cells

Galvanic cell- classification of cell – representation of cell – cell terminology. Reversible and irreversible cells - Electrode potentials – types of electrodes and their potentials. Nernst equations - Computation and measurement of cell emf and Weston - Cadmium cell - Single electrode potentials. Determination and significance of electrode potentials - Electrochemical series and its applications- Thermodynamic quantities of cell reactions ( $\Delta G$ ,  $\Delta H$  and  $\Delta S$ ) (12 hours)

**UNIT - III****Electrodes and their types**

pH scale – Buffer solution, Buffer action – Henderson's equation – determination of pH of Buffer solution. Concentration cells with and without transport - Liquid junction potential. Application of EMF measurements – determination of pH using hydrogen, glass and quinhydrone electrode. Potentiometric titrations – acid - base, redox and precipitation. Redox Potentials - redox indicators - diphenyl amine. (12 hours)

**UNIT – IV****Corrosion and Fuel Cells**

**\*Corrosion –Definition, types, electrochemical nature, rusting of iron, prevention - cathodic protection and galvanizing.**

Fuel cells - Definition and importance, Hydrogen-Oxygen fuel cell, hydrocarbon - Oxygen cell. Storage cells, Lead storage cells and Nickel- MH cells, Lithium ion cell. Decomposition Voltage, Over voltage – measurement of over voltage. Deposition or Discharge Potential cells. (12 hours)

**UNIT - V****Polarography and Adsorption**

Polarography-instrumentation-Advantages of dropping mercury electrode-Limiting current, factors affecting limiting current - Half wave potential – Ilkovic equation ( derivation not necessary) - Application of polarography.

Sorption – Absorption, Adsorption-Types of adsorption, adsorption of gases by solids. Adsorption isotherms –Freundlich, Langmuir. Adsorption of solutes from solutions. Application of adsorption. (12 hours)

**\*self study portion****Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. P. L. Soni. O. P. Dharmarha and U. N. Dash, (2013) **Textbook of physical chemistry**, S. Chand & Co., New Delhi,.
2. B. R. Puri, L. R. Sharma, M. S. Pathania, (2009) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.
3. B.S. Bahl and G. D. Tuli, and Arun Bahl, (2012) **Essentials of Physical Chemistry**,S. Chand publishing, Revised multicolor edition.
4. P. C. Jain and Monika Jain, (2009) **Engineering Chemistry**, Dhanpat Rai Publishing Co., New Delhi.

**REFERENCE BOOKS**

1. Karen C. Timberlake, (2005) **Basic Chemistry**, Los Angeles Valley College, Pearson Benjamin Cummings New York.
2. Samuel Glasstone,(2002) **Introduction to Electrochemistry**, EWP Pvt. Ltd.,
3. Syed Aftab Iqbal, (2011)**Text Book of Electrochemistry**, Discovery Publishing house Pvt. Ltd., New Delhi.

**18UCH508****MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	H	M	H
<b>CO3</b>	S	S	H	M	H
<b>CO4</b>	S	S	M	M	H

**S** – Strong**H** – High**M** – Medium**L** – Low



<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH5S3		<b>Title:</b> SKILL BASED SUBJECT - III <b>INDUSTRIAL CHEMISTRY</b>		
Batch 2018-2019	Semester V	Hours / Week 2	Total Hours 30	Credits 3

**Course Objectives**

1. To gain knowledge about manufacture of sugar and Fermentation.
2. To get the knowledge about Glass, Cement and Ceramics.
3. To have a holistic idea about Pigments and Paints.

**Course Outcomes (CO)**

K1, K2,K3,K 4, K5	CO1	Know about the manufacture of cane sugar from sugar cane beetroot.
K2, K3, K4,K5	CO2	Understand the conditions of fermentation, characteristics of enzymes and manufacture of beer, wines and poweralcohol.
K1, K2,K3,K 5	CO3	Acquiring knowledge of industrial glass products and methods of manufacture and its types.
K2, K3, K4, K5	CO4	Learn about cement, ceramics, pigments and paints.

**UNIT-I****Sugar Industry**

Introduction - manufacture of cane sugar - Extraction of juice - Purification of juice - Defection -sulphitation and carbonation. Concentration or evaporation – Crystallization - separation of crystals - Drying - Refining - Grades. Recovery of sugar from molasses. Manufacture of sucrose from Beetroot. (6 hours)

**UNIT –II****Fermentation**

Introduction - historical - conditions favourable for fermentation. Characteristics of enzymes - short account of some fermentation processes. Alcohol beverages - manufacture of beer, wines, vinegar and power alcohol. Ethyl alcohol from molasses. (6 hours)

**UNIT-III****Glass**

Introduction - Physical and chemical properties of glass - Raw materials - Methods of manufacture. Formation of the batch material – melting – shaping - annealing and finishing. Types of Glasses - soda glass - flint glass - pyrex glass - jena glass and safety glass. (6 hours)

**UNIT – IV****Cement and Ceramics**

Cement: \***Manufacture of cement - Settling of cement (Portland cement)**

Ceramics: Manufacturing process - Application of colours to the pottery - Earthenware's and Stonewares. (6 hours)

**UNIT V****Pigments and Paints**

Pigments: Introduction -Requirements of a pigment - Typical inorganic pigments - Applications.

Paints: Classification of paints – Distempers - Constituents of paints - Setting of paint - Requirements of a good paint - Emulsion paints - Latex paints - Paint removers - Varnishes - Solvents and thinners. (6 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

- 1.Sharma B.K., (2003) **Industrial Chemistry**, Goel Publishing House, Meerut.
2. Jain & Jain., (1998) **Engineering Chemistry**, Dhanpat Rai Publishing Company Private Ltd, New Delhi.

**REFERENCE BOOKS**

1. J.R. Kapuria, (1996) **Paint Manufacture**, SBP Board of Consultants and Engineers PVT Ltd., New Delhi.
2. M.M. Uppal, (1998) **A Text Book of Engineering Chemistry**, Khanna Publishers, New Delhi.
3. R. Gopalan, D. Venkappayya, S. Nagarajan, (2000) **Engineering Chemistry**, Vikas Publishing House PVT Ltd.
4. H. L. Whitc, (1986) **Introduction to Industrial Chemistry**, A Wiley Interscience Publication (John Wiley & Sons).

18UCH5S3

**MAPPING**

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	S	S
CO2	H	S	S	S	S
CO3	M	H	S	S	S
CO4	H	H	S	S	S

S – Strong

H – High

M – Medium

L – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH609		<b>Title:</b> CORE CHEMISTRY PAPER – IX <b>INORGANIC CHEMISTRY - II</b>		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To know about fundamentals of crystallography, defects in crystals, metallic bonding and alloys.
2. To learn about liquid crystals.
3. To study about reactions of complexes and bio-inorganic chemistry.

### Course Outcomes (CO)

K1, K2	CO1	Knowing the difference between amorphous and crystalline solids and their arrangement in crystal lattice.
K2, K3	CO2	Learn about defects in crystals, various theories of metallic bonding and alloys.
K2, K3	CO3	Decide the various crystal structures using X-ray diffraction techniques and study about liquid crystals.
K3, K4	CO4	Study about various ligand substitution reactions, electron transfer reactions in complexes and Bio-inorganic Chemistry.

### UNIT-I Solid state - I

\***Amorphous and crystalline solids**, symmetry elements and symmetry operations in crystals, space lattice and unit cell. Bravais lattices, seven crystal system, Designation of planes in crystals – Miller indices, close packing of identical solid spheres (CCP, FCC, HCP and BCC), radius ratio rule and shape of ionic crystal. Number of particles per unit cell and density of crystals. (12 hours)

### UNIT II Solid state - II

1. Defects in crystal – Stiochiometric and non Stiochiometric defects.
2. Metallic bonding- theories- electron gas theory, Valence bond theory, Molecular orbital theory (Band theory) – True metal or conductor, insulators, semi conductors- types of semi conductors- intrinsic and extrinsic, n and p- type.
3. Alloys- substitutional and interstitial solid solutions, inter metallic compounds – Tamman's rule, Hume – Rothery rule. (12 hours)

### UNIT III Crystallography and liquid crystals

X-ray diffraction studies of crystals – Bragg's equation – Bragg method and powder method – crystal structure of NaCl and ZnS. Growth of a crystals from the Melt and the solution  
Liquid crystals – Types, The Swarm theory of liquid crystals, applications. (12 hours)

**UNIT - IV****Coordination Chemistry**

Ligand substitution reactions in octahedral complexes -  $SN_1$  and  $SN_2$  mechanisms.

Ligand substitution reactions in Square – planar complexes : trans effect – trans effect series, theories of trans effect – Electrostatic polarization theory and pi bonding theory.

Electron transfer reactions – Inner sphere and outer sphere mechanism, Complementary and non complementary electron transfer reaction. (12 hours)

**UNIT – V****Bioinorganic chemistry**

Porphyrin systems-Myoglobin and hemoglobin-Role of myoglobin and hemoglobin in biological systems – cooperativity effect – explanation of cooperativity effect in hemoglobin-metallo enzymes – inhibition and poisoning of enzymes – role of alkali and alkaline earth metals in biological systems –sodium pump –calcium pump – biological functions and toxicity of some elements – biological fixation of nitrogen. (12 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

**TEXT BOOKS**

1. Sathya Prakash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
2. Wahid Malik, G.D Tuli, R. D. Madhan, (2006) **Selected Topics in Inorganic Chemistry**, S. Chand & Company, New Delhi.
3. B.R.Puri,L.R.Sharma and K.C.Kalia, (2009) **Principles of Inorganic Chemistry** Milestone Publishers, New Delhi.
4. Gurdeep raj, ( 2011) **Advanced Inorganic Chemistry**, Vol.1 , Goel Publishing House, Meerut.
5. Gurdeep raj, (2010) **Advanced Physical Chemistry** , Vol.1 , Goel Publishing House, Meerut.

**REFERENCE BOOKS**

1. M.G. Arora, (1997) **Solid State Chemistry**, Anmol Publishing House, New Delhi.
2. R.D.Madhan, (2011)**Modern Inorganic Chemistry**, S.Chand & Company, New Delhi.
- 3.Asim K.Dass, (2007) **Bioinorganic Chemistry**, Books and Allied (p) Ltd, Kolkata.

MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	M	H
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	S	S	M	M
<b>CO4</b>	S	M	S	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH610		<b>Title:</b> CORE CHEMISTRY PAPER – X <b>ORGANIC CHEMISTRY – II</b>		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

**Course Objectives**

1. To study about Terpenoids and Alkaloids.
2. To understand about Vitamins and Hormones.
3. To learn about Chemotherapy and Green Chemistry  
Reactions, applications of Green Chemistry and its limitations.

**Course Outcomes (CO)**

K2, K3	CO1	Study on the classification, structural elucidation and synthesis of few important terpenoids.
K2, K3	CO2	Learn about structural determination and synthesis of alkaloids.
K1, K3	CO3	Acquire basic knowledge about vitamins and hormones.
K2, K3	CO4	Analyze structural aspects, functions and mode of action of various drug molecules. Acquire basic knowledge about green chemistry.

**UNIT –I****Terpenoids**

Terpenoids: Introduction, classification and general methods of isolation. Isoprene rule, structural elucidation and synthesis of Geraniol, terpineol, dipentene and alpha-pinene.  
(12 hours)

**UNIT-II****Alkaloids**

Introduction, classification, general characteristics and general methods of determining structures and Hoffmann's exhaustive methylation. Structural elucidation and synthesis of Nicotine, Coniine, Piperine and Papaverine.  
(12 hours)

**UNIT III****Vitamins and Hormones**

*\*Introduction, classification, sources of Vitamins and their deficiency diseases.* Structural elucidation and synthesis of Thiamine and Riboflavin.

**Hormones** -Introduction, structural elucidation and synthesis of adrenaline and thyroxin.

(12 hours)

**UNIT-IV****Chemotherapy**

Designation of drugs based on physiological action – functional and pharmacodynamic drugs – chemotherapeutic drugs. Definition and two examples each of antibacterial drugs- sulpha drugs and mode of action of sulpha drugs, Antimalarial drugs, Amebicidal drugs, Antiseptics, Anaesthetics, Analgesics – Narcotic and synthetic- Antipyretics and anti-inflammatory agents - Antibiotics - Penicillin, streptomycin, and tetracyclins.  
(12 hours)

**UNIT-V**

**Green Chemistry:** Introduction-definition-Need for green chemistry- Goals - Limitations – Progress of Green Chemistry - principles of green chemistry- Concept of Atom economy- Concept of Selectivity.

**Green Reactions:** Green reactions- Solvent free synthesis of Aldol condensation (Acid catalyst, Crossed aldol), Claisen rearrangement, Clemmensen reduction, Diels-Alder reaction. (12 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
2. M. K. Jain and S. C. Sharma, (2011) **Modern Organic Chemistry**, New Delhi.
3. V. Kumar, (2008) **An Introduction to Green Chemistry**, Vishal Publishing Co.
4. V.K. Ahluwalia, (2006) **Green Chemistry**, Ane Books India, New Delhi.

**REFERENCE BOOKS**

1. Jagdamba Singh and Yadav, (2005) **Organic Chemistry**, Vol. I and II, Pragathi Prakasam Publishers.
2. I. L. Finar, (2010) **Organic Chemistry**, Vol. I and Vol.II, Addison-Wesley Longman.
3. Gurdeep Chatwal, (2013) **Organic Chemistry of Natural Products**, Himalaya Publishing House, New Delhi.
4. Morrison R.T. and Boyd R.N, (2008) **Organic Chemistry** New York, Allyn & Bacon Ltd.

18UCH610

**MAPPING**

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	H
CO2	S	H	H	M	H
CO3	S	H	M	H	S
CO4	S	S	S	S	S

S – Strong

H – High

M – Medium

L – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH611		<b>Title:</b> CORE CHEMISTRY PAPER - XI <b>PHYSICAL CHEMISTRY - II</b>		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To understand the basics and theoretical aspects of Chemical kinetics.
2. To learn about kinetics of thermal and photochemical reactions.
3. To gain knowledge about importance of catalysis and colloids.

### Course Outcomes (CO)

K1,K2	CO1	Understand the basic principles, various experimental techniques and theories of chemical kinetics.
K2,K4	CO2	Gain the knowledge about principles of photochemical and photosensitized process.
K2, K3	CO3	Study the basic principles and types of catalysis.
K1, K3	CO4	Explore the fundamentals of colloids and its applications.

### UNIT- I

#### Chemical Kinetics-I

Empirical laws and experimental aspects. Rate law, stoichiometry, order and molecularity of reactions. Setting up and solving simple differential equations for first order, second order, third order and zero order reaction. Expressions for half – life periods of first order, second order, zero order and third order reactions. Determination of order of reactions. Experimental techniques involved in the following kinetics of reaction. Volumetry, Manometry, Dilatometry, Polarimetry and Colorimetry. Typical examples for each of the techniques. (12 hours)

### UNIT- II

#### Chemical Kinetics-II

Theoretical aspects: Effect of temperature on the rate constant. The activation energy. Significance of free energy of activation. The collision theory of reaction rates and its limitations. The theory of absolute reaction rates (ARRT). Comparison of the collision theory with the absolute reaction rate theory. Lindemann theory of uni-molecular reactions. (12 hours)

### UNIT- III

#### Kinetics of Photochemical Reactions

Dark reactions - Complex thermal reactions – Thermal chain reaction - the  $H_2$  -  $Br_2$  reaction. Absorption of light and photochemical processes – Laws of photochemistry - The Stark–Einstein law of photochemical equivalence. Kinetics of photochemical chain reaction - the  $H_2$  /  $Br_2$  reaction. Quantum yield of photochemical reactions. Comparison of the thermal and photochemical kinetics of the  $H_2$  /  $Br_2$  reaction. Photosensitized reactions – photophysical process, Fluorescence, Phosphorescence and Chemiluminescence. (12 hours)



**UNIT- IV****Catalysis**

Catalysis – types of catalysis – homogeneous catalysis – heterogeneous catalysis – Characteristics of catalytic reactions – Promoters – Catalytic poisoning – Auto catalysis – Negative catalysis – Activation energy and Catalysis – Theories of catalysis – Intermediate Compound Formation Theory, Adsorption Theory - Hydrogenation of ethylene in presence of Nickel – Acid-base catalysis – Enzyme catalysis – Mechanism of enzyme catalysis – Industrial applications of Catalysts. (12 hours)

**UNIT- V****Colloids**

**\*Colloids - Definitions – types of colloids** – sols – preparation, purification and properties – Kinetic, Optical and Electrical. Stability of colloids, gold number, associated colloids – Cleansing action of soaps and detergents. Emulsion – types of emulsions, preparation, properties and application, Gels – types of gels, preparation, properties and applications. Applications of colloids. (12 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. Arun Bahl and B. S. Bahl, G. D. Tuli, ( 2012) **Essentials of Physical Chemistry**, S. Chand & Co., Revised multicolor edition.
2. B. R. Puri, L. R. Sharma, and M. S. Pathania, (2009) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.
3. P. L. Soni, O. P. Dharmarha and U. N. Dash, (2013) **Textbook of Physical Chemistry**, S. Chand & Co., New Delhi.

**REFERENCE BOOKS**

1. Keith J. Laidler and John H. Meiser,( 2006) **Physical Chemistry**, CBS Publishers & Distributors, New Delhi.
2. Gurudeep Raj, (2009) **Advanced Physical Chemistry**, Goel Publishing House, Meerut.
3. K. K. Rohatgi Mukherjee, (2014) **Fundamentals of Photochemistry**, New age International Publishers.

MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	M
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	M	H	M
<b>CO4</b>	S	S	H	M	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH6S4		<b>Title:</b> SKILL BASED SUBJECT - IV <b>FOOD CHEMISTRY</b>		
Batch 2018-2019	Semester VI	Hours / Week 2	Total Hours 30	Credits 3

### Course Objectives

1. To have an idea about food adulteration and food preservation techniques.
2. To understand the chemistry of vinegar, fruit juices, vegetable acids and beverages.
3. To determine the calorific value of foods.

### Course Outcomes (CO)

K1, K2, K3, K4, K5	CO1	Know about the food adulteration, standards of food, contamination and food poisoning.
K1, K2, K3, K4, K5	CO2	Understand about the different preservatives in packaged food.
K1, K2, K3, K4, K5	CO3	Acquiring knowledge about vinegar, fruit juice, pH value and mineral acids in vinegar. Know about characteristics and adulterations in beverages.
K2, K3, K4	CO4	Understand the calorific values of oils and food.

### UNIT- I

#### FOOD ADULTERATION AND HYGIENE:

**\*Definition – Food standards – Food Standards in India – Standards for ensuring quality of Products** – Common adulterants in different foods – Contamination of foods with toxic chemicals, pesticides and insecticides. Contamination of food with harmful micro-organisms – Bacterial infections – Fungal contaminations of foods – Toxicants naturally occurring in some foods – Insect and rodent contamination of stored foods. (6 hours)

### UNIT- II

#### PRESERVATION OF FOOD

Introduction - Chemical Preservatives - Cold Storage - Foods preserved in Tinned Iron and Glass Containers - Inspection of Tinned foods - The action of Tinned foods on the container. Poisonous Metals in foods - Detection and determination of Tin, Lead and Copper, Zinc and Aluminium in foods - Arsenic in foods - The Gutzeit test for Arsenic – Examination of glucose for the presence of Arsenic, Antimony in beverages. (6 hours)

### UNIT- III

#### VINEGAR, FRUIT JUICES AND VEGETABLE ACIDS

Preparation and properties of Vinegar. Examination of Vinegar – Determination of Total Solids and examination of residue, Total acidity, Mineral acids in Vinegar, Colour reactions for the detection

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of mineral acids, Hydrogen ion Concentration, pH Value, Methods of determining pH, detection of mineral acids in Vinegar by pH Value, Alcohol in Vinegar. Fruit Juices and Vegetable Acids: Examination of Lime Juice, Lemon Squash, etc., (6 hours)

### UNIT -IV

#### BEVERAGES

Tea - Nature and Properties of Tea - Adulteration of Tea - Tea Infusions. Coffee - Nature and Properties of Coffee - Adulteration of Coffee with Chicory. Cocoa and Chocolate - Nature and properties of Cocoa and Chocolate - Adulteration of Cocoa. Alcoholic Beverages - Introduction - Determination of Alcohol - Proof Spirit - Denaturing of Alcohol. (6 hours)

### UNIT -V

#### THE CALORIFIC VALUE OF FOODS

Introduction - The Bomb Calorimeter - Determination of the Calorific Value of a Substance, Outline of Method - Determination of the Water Equivalent of the Apparatus - Determination of the Calorific Value of Olive Oil and of Cooked Potato. (6 hours)

*\*self study portion*

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOKS

1. C. Kenneth Tinkler and Helen Masters,( 2005) **Applied Chemistry**, Vol. II, London.
2. M. Swaminathan, (2003) **Advanced Text Book on Food and Nutrition**, Vol. II, .
3. B. Sri Lakshmi, (2002) **Nutrition science**, New Age International Pvt. Ltd., New Delhi.

#### REFERENCE BOOKS

1. M. Swaminathan, (2003) **Handbook of Food and Nutrition**, The Bangalore Printing and Publishing Co. Ltd.,
2. B. Sri Lakshmi, (2003) **Food Science**, New Age International Pvt. Ltd., New Delhi.
3. S. D. Venkataiah,( 2004) **Nutrition Education**, Anmol Publication Pvt. Ltd.,

MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO3</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH6CN		<b>Title:</b> CORECHEMISTRY PRACTICAL – III <b>GRAVIMETRIC ANALYSIS</b>		
Batch 2018-2019	Semester V & VI	Hours / Week 3	Total Hours 90	Credits 3

### Course Objectives

1. To understand the concept of gravimetric analysis.
2. To get acquainted with the experimental procedure of gravimetric analysis.
3. To determine the quantity of analyte in solution.

### Course Outcomes (CO)

K1, K2	CO1	Understand the basic principles of Gravimetric analysis.
K2, K4	CO2	Understand about the various precipitating agents.
K3, K4	CO3	Determination of analyte masses through the gravimetric analysis.
K4	CO4	Improve the accuracy of analysis.

### I. Gravimetric Analysis

1. Estimation of Sulphate as Barium sulphate.
2. Estimation of Barium as Barium Chromate.
3. Estimation of Lead as Lead Chromate.
4. Estimation of Calcium as Calcium Oxalate.
5. Estimation of Nickel as Nickel Dimethylglyoxime.

### REFERENCE BOOKS

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Mendham. J, Denney, R.C. Barnes. J.D and Thomas. (2000) M, **Vogel's Text book of Quantitative Analysis**, Pearson Education.
3. Gopalan.R, Subramaniam P.S and Rengarajan. (2004) K, **Elements of Analytical Chemistry**, Sultan Chand and Sons.

## UCH 60

Time: 3 hours

Max. Marks : 60

### Distribution of Total Marks- 60

Record	10
Gravimetric	50

### Distribution of Gravimetric Marks-50

Procedure (To be written within five minutes)	5
Experiment	45
Error up to 2%	45
3%	35
4%	25
5%	15
>5%	5

- ❖ Proportionate deduction of marks must be made for errors between the limits given above.
- ❖ Examiners should calculate the result of each candidate with the data obtained by the candidate.
- ❖ For each independent arithmetic error deduct 2 marks.
- ❖ For incomplete or wrong calculation deduct 20% of marks eligible for the result as calculated by the examiners.
- ❖ For incomplete or wrong calculation deduct 30% of marks eligible for the result as calculated by the examiners.
- ❖ If there is a difference between the two results, the examiners should consider the one favorable to the candidate.
- ❖ If a candidate is not able to complete the experiment due to accident, award 5 marks.

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### MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	H
CO2	S	S	M	H	H
CO3	S	S	H	M	H
CO4	S	S	M	H	H

S – Strong

H – High

M – Medium

L – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH6CO		<b>Title: CORECHEMISTRY PRACTICAL – IV PHYSICAL CHEMISTRY EXPERIMENTS</b>		
Batch 2018-2019	Semester V & VI	Hours / Week 3	Total Hours 90	Credits 3

### Course Objectives

1. Transformation of theoretical knowledge gain to practical aspects.
2. To have experience in handling electrical and non-electrical equipments.
3. To determine the strength of various solutions through spectrometric and electrochemical techniques.

### Course Outcomes (CO)

K1, K2	CO1	The results of physical chemistry experiments are incorporated in both theoretical and practical aspects.
K2, K4	CO2	Gain familiarity with a variety of physico-chemical measurement techniques.
K3, K4	CO3	Interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.
K4	CO4	Obtain the knowledge about the theories of electrolysis and Chemical kinetics.

### Physical Chemistry Experiments

1. Determination of Partition coefficient of Iodine between Carbon tetra chloride and water.
2. Determination of rate constant of acid- catalysed hydrolysis of an (Methyl acetate OR Ethyl acetate)
3. Determination of  $K_f$  / Molecular weight by Rast Macro method (Naphthalene, Diphenyl and m-dinitrobenzene as solvents).
4. Determination of Critical solution temperature of Phenol- Water system.
5. Determination of concentration of an electrolyte (NaCl/ KCl/ Succinic acid)
6. Determination of Transition temperature of the hydrated salt (Sodium acetate, Sodium thio Sulphate and  $SrCl_2 \cdot 6H_2O$ )
7. Phase diagram-Simple Eutectic system
8. Determination of Cell Constant, Specific conductivity and Equivalent conductivity of strong electrolyte
9. Determination of dissociation constant of a weak acid (Acetic acid)
10. Conductometric Titration (Strong acid Vs Strong base)
11. Potentiometric Titration (Acid-Base Titration HCl Vs NaOH)
12. Potentiometric Titration (Redox Titration FAS Vs  $KMnO_4$ )
13. Estimation of Manganese by colorimetric method.



**REFERENCE BOOKS**

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Gopalan. R, Subramaniam. P.S., and Rengarajan, K.,( 2004) **Elements of Analytical Chemistry**, Sultan Chand and Sons.

**Time: 3 hours**

**Max. Marks : 60**

**Distribution of Physical Practical Marks-60**

Record	10
Experiment	50

**Distribution of Marks for each Experiment**

**1. Equilibrium Constant**

For carrying out the experiment	- 13
Remaining Marks given below	- 37
Calculation of [KI]	- 8
Calculation of [I <sub>2</sub> ]	- 8
Calculation of [KI <sub>3</sub> ]	- 8
Value of equilibrium	
Constant error up to 10%	- 13
10-12%	- 8
12-14%	- 5
>14%	- No Marks

**2. Strength of KI Solution may be given in the range from 0.02N to 0.06N**

Calculation of [KI]	- 8
Calculation of [I <sub>2</sub> ]	- 8
Calculation of [KI <sub>3</sub> ]	- 8
Calculation	
Strength of given [KI] Solution	- 5

For wrong calculation of above value, 50% of marks to be deducted for those steps only.

**3.HCl or H<sub>2</sub>SO<sub>4</sub>, 0.5N to be given. If the order of difference between theoretical and candidates value is**

Below a factor of 10 Between 10-20 Above 20-37  
 - reduce 3 marks for each factor -5 marks

**4. Critical Solution Temperature of Phenol-Water system is 67.0 °c**

Phenol-Water system	
Plot of % Phenol Vs Temp.	-37
Error up to ±3°c	-15
Error up to ±3°c to 15°c	- reduce 3 marks for each percent
Above ±15°c	-5

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### 5. Candidate may be instructed to use solutions of strength 1% and below. Unknown solution must be below 0.8%

Plot of %NaCl Vs Temp	- 20
Determination of % NaCl Solution	- 17
Error up to 1%	- 17
Error up to 1-2%	- 14
Error up to 2-3%	- 10
Error above 3%	- 05

### 6. 0.1N Acetic acid and 0.1N KCl 100ml each to be given

Calculation of cell constant	- 17
Correct Eq. Conductance of Acetic acid	- 17
Error up to 10%	- 20
Error up to 10% to 20%	- reduce 1 mark for each %.

### 7. 0.1N Acetic acid 100ml and 0.1N KCl 100ml to be given

Calculation of cell constant	- 13
Correct Eq. Conductance of Acetic acid	- 13
Calculation of dissociation constant	- 10
Reduce marks for errors as in <b>experiment-6</b> above	

### 8. 0.02N HCl may be given

Error up to 5%	- 37
Error up to 5-10%	- reduce 3 marks for each %
Error up to 10-15%	- reduce 3 marks for each %
Error above 5%	- 05

### 9. Rast method

Solvent Kf	Solute
1. Naphthalene (6.9°C)	1. Biphenyl
2. Diphenyl (8-8.4°C)	2. Naphthalene
3. Diphenyl amine (8.4 – 8.8°C)	3. Dichlorobenzene

For each step error has to be worked out

Melting point of solvent	- 07
Error upto $\pm 10\%$	- 30
Error upto $\pm 20\%$	- 15
Above 20%	- 05

### 10. Phase diagram.....37

Melting point of A	- 06
Melting point of B	- 06
Construction of phase diagram-	09
Eutectic temperature	- 08
Eutectic composition	- 08
Error up to 1%	- 08

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Error up to 2%	- 06
Error up to 3%	- 04
Error > 3 %	- 0

### 11. Colorimetric Experiments

Error upto 1%	- 37
Error upto 2%	- 30
Error upto 3%	- 20
Error > 3%	- 05

## 18UCH6CO

### MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	M	S
<b>CO2</b>	S	S	H	H	S
<b>CO3</b>	S	S	H	H	S
<b>CO4</b>	S	S	S	M	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
<b>Course Code:</b> 18UCH6CP		<b>Title:</b> CORECHEMISTRY PRACTICAL – V APPLICATION ORIENTED PRACTICAL		
Batch 2018-2019	Semester V & VI	Hours / Week 4	Total Hours 120	Credits 4

### Course Objectives

1. To demonstrate the basic laboratory techniques and application oriented physical constants.
2. To prepare organic dyes, organic compounds and home care products.
3. To estimate the hardness of water, DO, available chlorine in bleaching powder and saponification value of an oil.

### Course Outcomes (CO)

K1, K2	CO1	Gain the knowledge of physical constants and preparation of dyes.
K2	CO2	Know about the preparation of organic compounds.
K2, K4	CO3	Learn about the preparation method of home care products.
K2, K3	CO4	Learn about estimation of hardness of water, dissolved oxygen, saponification of oil and isolation of citric acid.

#### I. Determination of Physical Constants.

1. Determination of Melting point
2. Determination of Boiling point.

#### II. Preparation of Organic dyes

Preparation of dyes like Methyl Orange, Methyl Red, Azo Amino benzene.

#### III. Preparation of Organic Compounds

Preparation involving Acetylation, Hydrolysis, Oxidation, Halogenation, Nitration and Benzoylation

#### IV. Preparation of Home care products

1. Preparation of white phenyl
2. Preparation of soap oil
3. Preparation of detergent powder
4. Preparation of transparent soap
5. Preparation of moisturizing cream

#### IV. Estimations

1. Estimation of Hardness of water using EDTA
2. Estimation of dissolved oxygen in water
3. Estimation of alkalinity in water

## UCH 66

4. Estimation of calcium in limestone by EDTA method
5. Estimation of Total Fatty Matter (TFM) of a soap
6. Estimation of acid value of an oil
7. Estimation of available chlorine in bleaching powder

### REFERENCE BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Mendham. J., Denney. R.C., Bames. J.D. and Thomas, (2000) **M. Vogel's Text Book of Quantitative Analysis**, Pearson Education.
3. Sharma, K.K. and Sharma, D.S. (2005) **Introduction to Practical Chemistry**, Vikas Publishing House, New Delhi.
4. Praveen Kukreja, (2006). **Chemistry Advanced Practical Manual**, Vrinda Publishing (p) Ltd, New Delhi.

**Time: 3 hours**

**Max. Marks : 60**

#### Distribution of Total Marks- (60)

Record	10
Physical Constant	10
Estimation	25
Preparation	15

#### Distribution of Physical Constant Marks- (10)

$\pm 2^\circ$	10
$\pm 3^\circ$	8
$\pm 4^\circ$	6
$\pm >4^\circ$	5

#### Distribution of Estimation Marks- (25)

Error up to 2%	25
3%	20
4%	15
5%	10
>5%	5

#### Distribution of Preparation Marks- (15)

Quantity	10
Recrystallisation / Quality	5

MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	S	S	H
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	S	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 68

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
		<b>Title: MAJOR ELECTIVE - I POLYMER CHEMISTRY</b>		
Batch 2018-2019		Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To know about the types of polymers, polymerization techniques and physical properties of polymers.
2. To learn about polymer processing and synthesis of some commercially important polymers.
3. To have an idea about recent advances in polymer science.

### Course Outcomes (CO)

K1, K2	CO1	know about the types of polymers, chemical and physical properties, its industrial applications and uses.
K2, K3, K4	CO2	Understand the various polymerization techniques, processing and different types of individual polymer products.
K1, K2, K3, K5	CO3	Acquiring knowledge of commercially important polymer products and its applications.
K2, K3	CO4	know about the recent advances in polymer products and their applications.

### UNIT-I

#### Introduction to polymers

**Genesis of polymers: \*Basic concept – monomers and polymers – definition.** Classification of polymers – natural and synthetic polymers – organic and inorganic Polymers – Thermoplastic and thermosetting polymers – plastics, elastomers, fibers and liquid resin.

**Chemistry of Polymerization:** Types – Chain polymerization – Free radical polymerization, Ionic polymerization, coordination polymerization. Step Polymerization – polycondensation, poly addition, ring opening. Miscellaneous polymerization reactions – electrochemical. Group transfer polymerization. (9 hours)

### UNIT-II

#### Polymer properties and Reactions

**Molecular weight and Size:** Average molecular weight - number average - weight average molecular weights – concepts. Sedimentation and viscosity Average molecular weights - Molecular weight and degree of polymerization.

**Glass Transition Temperature (T<sub>g</sub>):** Definition, Transition and Associated properties, Factors influencing the glass transition temperature. Photo oxidative degradation of polymers. (9 hours)

### UNIT-III Polymerization Techniques and Processing

**Polymerization techniques:** Bulk, Solution, Suspension, Emulsion and Interfacial poly condensation polymerization.

**Polymer Processing:** Introduction – plastic, elastomers and fibers. Processing Techniques- Calendaring – Die Casting – Rotational Casting – Film Casting – compression moulding – injection Moulding.

(9 hours)

### UNIT-IV Chemistry of Commercial Polymers

**General methods of preparations, Properties and uses of the following polymers:** Polystyrene, polymethylmethacrylate, polyesters, polyamides (Kevlar), Polyurethanes, Poly vinyl Chloride, Phenol Formaldehyde resin, Urea Formaldehyde resins, Epoxy resins, Teflon. (9 hours)

### UNIT-V Recent Advances in Polymers

**Biopolymers:** Cellulose – Rayon – Cellophane, Cellulose Nitrate – Carboxy Methyl cellulose. Silicones.

**Applications of polymers:** Biomedical applications, Drug delivery, artificial organs, Electronic Applications - Conducting polymers with examples. (9 hours)

*\*self study portion*

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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### TEXT BOOK

1. V. R. Gowariker, N.V. Viswanathan and Jayadev Sreedhar, (2012) **Polymer Science**, Revised Edition, New Age International Publishers, New Delhi.

### REFERENCE BOOKS

1. F.W. Billmeyer – (1990) **Text Book of Polymer Science**, John Wiley & Sons.
2. J.R. Fried, (2004) **Polymer Science & Technology**, Prentice Hall of India Private Ltd.
3. G.S. Misra, (1997) **Introductory Polymer Chemistry**, New Age International Private Ltd, New Delhi.
4. Sharma. B.K., GOEL Publishing House, Meerut,( 1989) **Polymer Chemistry**.
5. Arora. M.G., Singh. M, and Yadav. M.S., (1989) **Polymer Chemistry**, Anmol Publications Private Ltd., New Delhi.



# UCH 70

## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 71

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
		<b>Title: MAJOR ELECTIVE - II NANO AND DYE CHEMISTRY</b>		
Batch 2018-2019		Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To study the basics of Nano Chemistry and Nano materials.
2. To learn about instrumentation characterization of nano materials.
3. To understand the basic concepts of dye chemistry as colour and constitution.

### Course Outcomes (CO)

K1, K2	CO1	know about the types and classification of nano chemistry, and physical, chemical properties.
K2, K3, K4, K5	CO2	Understand the various methods of synthesis of nano materials
K2,K3,K4	CO3	Study the characterization techniques to analyze the nano materials.
K2, K3, K4	CO4	Acquiring basic knowledge of dye chemistry and industrial applications of dyes.

### UNIT - I

**Introduction to Nanoscience:** Definition of Nanomaterials-classification (1D, 2D and 3D) with examples-Synthesis top down and Bottom up Approach- Carbon Nanotubes-Types, properties and uses. (9 hours)

### UNIT- II

**Preparation of Nanomaterials.** Co-precipitation- sol- gel - chemical reduction- photochemical reduction –hydrothermal and solvothermal synthesis. (9 hours)

### UNIT-III

#### Instrumentation for nano characterization

Instrumentation required for characterization of properties on the nanometer scale. The measurable properties and resolution limits of each technique, with an emphasis on measurements in the nanometer range. SEM, TEM, AFM. (9 hours)

### UNIT-IV

#### Colour and constitution

Colour and constitution – Relationship of colour observed to wave length of light observed – terms used in colour chemistry – Chromophores, Auxochromes, Bathochromic shift and Hypsochromic shift. Colour of a substance –quinonoid theory, molecular orbital theory. (9 hours)

**UNIT-V*****Introduction to the dyes***

**\* Requisites of true dyes.** Textiles fibres, Dyeing - ionic interaction, hydrogen bond Vanderwalls interaction and covalent bonds. Basics operation in the dyeing process, various methods of dyeing - Direct, vat, mordant and disperse dyeing, formation of the dye on the fibre, dyeing of the wool with acid dyes and dyeing with reactive dyes. Fastness properties- colour, light, sublimation and burnt gas fumes fastness. (9 hours)

***\*self study portion***

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. S. Shanmugam, (2010) **Nanotechnology**, M.J.P. Publishers, Chennai.
2. Gurdeep Chatwal , (1990) **Synthetic Dyes**, Himalaya Publishing House, New Delhi.
3. M.G.Arora, (1996) **Text Book of Dyes**, Anmol Publications Private Ltd. New Delhi.

**REFERENCE BOOK**

1. G. Cao, (2004) **Nanostructures & Nano Materials**, Imperial College Press, U.K.
2. E.N. Abraham, (1969) **Dyes and Their Intermediates**, Bergamon Press.
3. H. A. Lubs, (1970) **The Chemistry of synthetic dyes and pigments**, ACS publication, Halner.
4. K.Venkataraman, (1949) **The Chemistry of Synthetic Dyes, Vol.I, II, III & IV**, Academic Press New York.
5. F. P. Schafer, (1976) **Physical and Chemical Applications of Dyestuffs**, Springer – Veriag N.Y.

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO4</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>M</b>	<b>M</b>

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 73

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
		<b>Title: MAJOR ELECTIVE - III PHARMACEUTICAL CHEMISTRY</b>		
Batch 2018-2019		Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To know about the common diseases and cure-terms of pharmacology and drug action.
2. To get introduced to chemotherapy – antibiotics.
3. To know the drugs meant for diabetes.

### Course Outcomes (CO)

K1, K2	CO1	gain the knowledge about the common diseases and cure-terms of pharmacology.
K2, K3, K4, K5	CO2	Understand about chemotherapy – antibiotics.
K2, K3, K4	CO3	Learn about drugs meant for diabetes.
K2, K3, K4	CO4	Basic ideas about various health promoting drugs.

### UNIT I

#### Introduction

Common diseases -infective disease – insect – borne, air borne and water borne - hereditary diseases - Terminology- drug, pharmacology, pharmacognesy, pharmacodynamics, pharmacokinetics, anti metabolites -absorption of drugs-routes of administration of drugs, factors affecting absorption drugs-routes of administration of drugs, factors affecting absorption –Assay of drugs-chemical, biological, immunological assays, LD50 and ED50 therepeutic index, drug dosage.  
(9 hours)

### UNIT II

#### Drugs

\*Various sources of drugs, pharmacologically active constitutents in plants, Indian medicinal plants-tulsi, neem, keezhanelli,- their importance-Classification of drugs- biological chemical-mechanism of drug action- Action at cellular and extra cellular sites. Drug receptors and biological responses- Metabolism of drugs through oxidation, reduction, hydrolysis and conjugate processes, factors affecting metabolism.  
(9 hours)

### UNIT III

#### Chemotherapy

Designation of drugs based on physiological action; Definition and two examples each of Anaesthetics-General, IV and local- Analgesics – Narcotic and synthetic- Antipyretics and anti-inflammatory agents –Antibiotics –Penicillin, streptomycin, chloramphenicol, tetracyclins-Antivirals, AIDS- symptoms, prevention, treatment- Cancer and neoplastic agents. (9 hours)

**UNIT IV**

**Common Body Ailments**

Diabetes-Causes, hyper and hypoglycemic drugs- Blood pressure- Systolic & Diastolic Hypertensive drugs- Cardiovascular drugs- anti arrhythmic, anti anginals, vasodilators- CNS depressants and stimulants- Psychedelic drugs, hypnotics, sedatives (barbiturates, LSD)- Lipid profile –HDL, LDL cholesterol, lipid lowering drugs. (9 hours)

**UNIT V**

**Health Promoting Drugs**

Nutraceuticals- Vitamins A, B, C, D, E and K micronutrients Na, K, Ca, Cu, Zn, I- Medicinally important inorganic compounds of Al, P, As, Hg, Fe – L examples each their role and applications- Organic Pharmaceutical acids, Agents for Kidney function (Aminohippuric acid), Agents for liver function (Sulfo bromophthalein), Agents for pituitary function (metyrapone)- Organic Pharmaceutical bases-anti oxidants, treatment of ulcer and skin diseases. (9 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOK**

1. Jayashree Ghosh, (2006) **Pharmaceutical Chemistry**, S.Chand and Company Ltd., New Delhi.

**REFERENCE BOOKS**

1. Lakshmi S., (1995) **Pharmaceutical Chemistry**, S. Chand & Sons, New Delhi.
2. Ashutosh Kar, (1993) **Medicinal Chemistry**, Wiley Eastern Ltd., New Delhi.
3. David William & Thomas Lemke, (2005) **Principles of Medicinal Chemistry**, Foyers, BI publishers.
4. Romas Nogrady, (2004) **Medicinal Chemistry**, Oxford University press.

**MAPPING**

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S

S – Strong

H – High

M – Medium

L – Low

## UCH 75

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
		<b>Title: MAJOR ELECTIVE - IV AGRICULTURAL CHEMISTRY</b>		
Batch 2018-2019		Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To know about basics of soil chemistry and the physical properties of soil.
2. To get introduced to chemistry aspects of soil and various nutrients present in soil- waste for one, food for another.
3. To know the chemistry of pesticides, fungicides and herbicides.

### Course Outcomes (CO)

K1, K2	CO1	To gain the knowledge about the origin soil.
K3, K4,	CO2	To understand about physical and chemical properties of soil.
K2, K4	CO3	To learn about plant nutrients.
K2, K3	CO4	basic ideas about pesticides, fungicides and herbicides.

### UNIT I

#### Origin of soil

**\*Definition of soil-origin-igneous-metamorphic and sedimentary rocks-rock systems-weathering of rocks and minerals** - main components of soil-organic, inorganic, liquid and gaseous phase-Minerals of importance with respect to soil, industries and agriculture –Soil formation physical, chemical and biological factors responsible for soil formation-soil forming processes- Core soil groups of Tamilnadu-Soil survey standard soil survey-methods of soil surveys –remote sensing and soil mapping-soil resource management-use of satellite data for source inventory. (9 hours)

### UNIT II

#### Physical Properties of Soil

Physical properties of soil-soil texture and textural classification-pore space-bulk density, particle density –soil structure and soil colour-surface area-soil colloids-plasticity, shrinkage-flocculation and deflocculation-soil air, soil temperature, their importance in plant growth-soil reaction –ion exchange reaction-cation exchange-anion exchange –buffering capacity – hydrogen ion concentration-determination of pH Values-factors affecting soil pH-soil pH and nutrient availability- Soil degradation –causes. (9 hours)

### UNIT III

#### Chemical Aspects of Soil

Origin of problem soils, their properties acid, alkali and saline soils-diagnosis-remediation of acid and salt effected soils –Methods of reaction and after care-Quality of irrigation water – causes for poor quality waters for irrigation, their effects in soil and crops. Soil testing-Concept,objective and basis-soil sampling, tools, collection processing, dispatch of soil and water samples. Soil organic

## UCH 76

matter-its decomposition and effect on soil fertility-source of organic matter in soil –maintenance and distribution –soil organism –their role-nitrification-denitrification, nitrogen fixation in soils-biological nitrogen fixation in soils –microbial interrelationship in soil-microbes in pest and disease management-Bio-conversion of agricultural wastes. (9 hours)

### UNIT IV

#### Plant Nutrients

Plant nutrients-macro and micro nutrients-their role in plant growth –sources-forms of nutrient absorbed by plants –factors affecting nutrient absorption-deficiency symptoms in plants-corrective measures-chemicals used for correcting nutritional deficiencies-nutrient requirements of crops, their availability, fixation and release of nutrients. Fertilizers –classification of NPK fertilizers –sources-natural and synthetic –straight –complex –liquid fertilizers, their properties, use and relative efficiency-secondary and micro nutrient fertilizers-mixed fertilizers –principles of fertilizers use –the efficient use of various fertilizers-integrated nutrient management biofertilizers –rhizobium, azospirillum, azotobacter-Blue green algae and azolla production and quality control of bio-fertilizers. (9 hours)

### UNIT V

#### Pesticides, Fungicides And Herbicides

**Pesticides:** Definition –classification –organic and inorganic pesticides-mechanism of action – Characteristics-Safe handling of pesticides –impact of pesticides on soil, plants and environment – Acts and Laws concerning the pesticides-. **Fungicides** Definition –classification – mechanism of action-Sulphur, copper-mercury compounds, dithanes, dithiocarbamates. **Herbicides:** Definition – Classification-mechanism of action-Arsenic and boron compounds-nitro compounds, chloro compounds, Triazines, propionic acid derivatives, urea compounds. Acaricides-Rodenticides-Attractants-Repellants-Fumiganus foliants. (9 hours)

*\*self study portion*

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOKS

1. Biswas ,T.D and Mukeherjee, S.K.( 1987) **Textbook of Soil Science**,Tata McGraw – Hill publishing co.
2. Daji, A.J. (1970) **Textbook of Soil Sciences**, Asia Publishing House, Madras.
3. Tisdale. S. L., Nelson. W. L. and Beaton. J. D.( 1990) **Soil Fertility and Fertilizers**, Macmillan Publishing Company, New York.

#### REFERENCE BOOKS

- 1.Hesse, (1971) **A Textbook of Soil Chemical Analysis** P.R. John Murray.
- 2.Buchel, K.H. John Wiley & Sons , (1983) **Chemistry of Pesticides**, New York.
- 3.Sree Ramula, (1979) **Chemistry of Insecticides and Fungicides Chemistry of Insecticides and Fungicides**, U.S. Oxford and IBH Publishing Co., New Delhi.

**UCH 77**

**MAPPING**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	H	S	S	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low



<b>Programme: B.Sc.,</b>		<b>Title: Chemistry</b>		
		<b>Title: MAJOR ELECTIVE - V</b>		
		<b>Green Chemistry</b>		
Batch 2018-2019		Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

- To know about the types of polymers, polymerization techniques and physical properties of polymers.
- To learn about polymer processing and synthesis of some commercially important polymers.
- To have an idea about recent advances in polymer science.

### Course Outcomes (CO)

K1, K2	CO1	know about the types of polymers, chemical and physical properties, its industrial applications and uses.
K2, K3, K4	CO2	Understand the various polymerization techniques, processing and different types of individual polymer products.
K1, K2, K3, K5	CO3	Acquiring knowledge of commercially important polymer products and its applications.
K2, K3	CO4	know about the recent advances in polymer products and their applications.

### UNIT-I

#### Introduction to polymers

**Genesis of polymers: \*Basic concept – monomers and polymers – definition.** Classification of polymers – natural and synthetic polymers – organic and inorganic Polymers – Thermoplastic and thermosetting polymers – plastics, elastomers, fibers and liquid resin.

**Chemistry of Polymerization:** Types – Chain polymerization – Free radical polymerization, Ionic polymerization, coordination polymerization. Step Polymerization – polycondensation, poly addition, ring opening. Miscellaneous polymerization reactions – electrochemical. Group transfer polymerization. (9 hours)

### UNIT-II

#### Polymer properties and Reactions

**Molecular weight and Size:** Average molecular weight - number average - weight average molecular weights – concepts. Sedimentation and viscosity Average molecular weights - Molecular weight and degree of polymerization.

**Glass Transition Temperature (T<sub>g</sub>):** Definition, Transition and Associated properties, Factors influencing the glass transition temperature. Photo oxidative degradation of polymers. (9 hours)

### UNIT-III Polymerization Techniques and Processing

**Polymerization techniques:** Bulk, Solution, Suspension, Emulsion and Interfacial poly condensation polymerization.

**Polymer Processing:** Introduction – plastic, elastomers and fibers. Processing Techniques- Calendaring – Die Casting – Rotational Casting – Film Casting – compression moulding – injection Moulding.

(9 hours)

### UNIT-IV Chemistry of Commercial Polymers

**General methods of preparations, Properties and uses of the following polymers:** Polystyrene, polymethylmethacrylate, polyesters, polyamides (Kevlar), Polyurethanes, Poly vinyl Chloride, Phenol Formaldehyde resin, Urea Formaldehyde resins, Epoxy resins, Teflon. (9 hours)

### UNIT-V Recent Advances in Polymers

**Biopolymers:** Cellulose – Rayon – Cellophane, Cellulose Nitrate – Carboxy Methyl cellulose. Silicones.

**Applications of polymers:** Biomedical applications, Drug delivery, artificial organs, Electronic Applications - Conducting polymers with examples. (9 hours)

*\*self study portion*

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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### TEXT BOOK

2. V. R. Gowariker, N.V. Viswanathan and Jayadev Sreedhar, (2012) **Polymer Science**, Revised Edition, New Age International Publishers, New Delhi.

### REFERENCE BOOKS

4. F.W. Billmeyer – (1990) **Text Book of Polymer Science**, John Wiley & Sons.
5. J.R. Fried, (2004) **Polymer Science & Technology**, Prentice Hall of India Private Ltd.
6. G.S. Misra, (1997) **Introductory Polymer Chemistry**, New Age International Private Ltd, New Delhi.
4. Sharma. B.K., GOEL Publishing House, Meerut,( 1989) **Polymer Chemistry**.
5. Arora. M.G., Singh. M, and Yadav. M.S., (1989) **Polymer Chemistry**, Anmol Publications Private Ltd., New Delhi.

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme: B.Sc.,</b>		<b>Title: Chemistry</b>		
		<b>Title: MAJOR ELECTIVE -VI</b>		
		<b>Chemical Industry</b>		
<b>Batch</b> 2018-2019		<b>Hours / Week</b> 3	<b>Total Hours</b> 45	<b>Credits</b> 5

**Course Objectives**

1. To know about the types of polymers, polymerization techniques and physical properties of polymers.
2. To learn about polymer processing and synthesis of some commercially important polymers.
3. To have an idea about recent advances in polymer science.

**Course Outcomes (CO)**

<b>K1, K2</b>	<b>CO1</b>	know about the types of polymers, chemical and physical properties, its industrial applications and uses.
<b>K2, K3, K4</b>	<b>CO2</b>	Understand the various polymerization techniques, processing and different types of individual polymer products.
<b>K1, K2, K3, K5</b>	<b>CO3</b>	Acquiring knowledge of commercially important polymer products and its applications.
<b>K2, K3</b>	<b>CO4</b>	know about the recent advances in polymer products and their applications.

**INDUSTRIAL CHEMISTRY**

## UCH 81

Sem	Subject Code	Subject Title	Instruction Hours	CIA	ESE	Total Marks	Credit
V	08UCH5E2	AOS2 INDUSTRIAL CHEMISTRY	3 x 15cycles	25	75	100	4

Units	Learning Objectives
I	To get into the requirements to start an industry-fuels used-catalysts used
II	To have a through idea about petro chemical industries
III	To understand the manufacturing of fertilizers-speciality chemicals
IV	To have knowledge about oils, soaps , detergents ,sugars,leather,pesticides
V	To understand the metallurgy of important metals

### Self-Study Portion

**1.Reference:** Page No 498 to 522, House Hold Chemicals- Helps and Hazards in

“Chemistry for Changing times”, 9th Edition, By John.W.Hill, and Doris.K. Kolb, Prentice Hall, Upper Saddle River, NJ 07458.

## UNIT-I: Industrial Requirements

Requirements of an industry-location- water-industrial water treatment-Safety measures- pilot plants. Fuels- Types of fuels with examples- coal-carbonization of coal- coal tar distillation – Liquid fuels- gaseous fuels- selection of fuels- nuclear fuels. Energy- Sources of energy- renewable and non-renewable energies- non conventional energies. Industrial catalysts- types of catalysts- functions and applications of Raney Nickel, Pd, CuCrO<sub>4</sub>, TiO<sub>2</sub>, Al, V and Pt based catalysts and Zeolites.

## UNIT II: Petrochemical Industries

Crude oil- constitution and distillation- composition of different distillates- pour points, depressants, drag reducers, viscosity reducers, ignition point, flash point octane number- cracking- catalysts used in petroleum industries- structure, selectivity and applications. Manufacture of synthetic petrol- Dergius and Fischer Tropsh processes- Manufacture of petrochemicals and petrochemical polymers- Manufacture of higher olefins, Acetaldehyde, Acetic acid, Ethylene glycol, Glycerine, Acetone, Phenol, Carbon disulphide, Vinyl acetate, Cumene, Chlorophrene, Butane diols, Xylenes, Lineral alkyl benzenes and their sulphonates.

### **UNIT III: Fertilizers And Speciality Chemicals**

Manufacture- properties and industrial uses of solvents- DMF, DMSO, THF and Dioxane. Fertilizers- Raw materials, manufacture (flow chart chemical process with equations) of ammonium nitrate, ammonium sulphate, urea, calcium cyanamide, calcium ammonium nitrate, sodium nitrate, ammonium chloride, ammonium phosphate, super phosphate of lime, NPK fertilizers. Manufacture in pure of the following- Sodium carbonate, Oxalic acid, Potassium dichromate, Perchloric acid.

### **UNIT IV: Oils, Soaps And Detergents**

Manufacture of  $\text{Cl}_2$ , NaOH and Chlorates of Na and K- Manufacture of Perchlorate. Oils- difference between oils and fats- Manufacture of cotton seed oil and soya bean oil- refining of oil- Manufacture of soaps- toilet and transparent soaps- Detergents- synthetic detergents- surface active agents and their classification- Manufacture of anionic, cationic and non ionic detergents and shampoo. Sugar industry- Manufacture of sugar from cane sugar and beetroot. Manufacture of leather- hides- vegetable and chrome tanning finishing. Manufacture of DDT, dinitrophenols, BHC, gamaxane, malathion, parathion, schradan and dementon.

### **UNIT V: Metallurgy**

General methods of metallurgy- ores- types- methods of concentration of ores- hydro metallurgy, pyrometallurgy- various methods of reduction process, refining of metals- extraction of Cr, Mn, V, Co, Pt, U and Th. Environmental problems of chemical industries- methods of control- sewage treatment and waste management. Man power in chemical industries- labour problems- six sigma (Basic concept only).

#### **Books For Reference**

1. Sharma B.K., Industrial chemistry, Goel publishing House, 2003, Meerut.
2. Drydens .C.E., Outlines of Chemical Technology, Gopala Rao, Eastwest press, New Delhi.

## UCH 83

3. Shreve .R.V., Chemical Process Industries, Tata Mc Graw Hill publishing company, Mumbai.

4. Steines .H., Introduction to Petrochemicals, Pergaman Press

5. Alan Cottrel, An Introduction to Metallurgy, Orient Longman(2000)

**NET REFERENCE:** (for assignment purpose mandatory)

1. <http://www.ask.com/>

2. <http://www.chemistry.about.com/>

### UNIT-I

#### Introduction to polymers

**Genesis of polymers:** \*Basic concept – monomers and polymers – definition. Classification of polymers – natural and synthetic polymers – organic and inorganic Polymers – Thermoplastic and thermosetting polymers – plastics, elastomers, fibers and liquid resin.

**Chemistry of Polymerization:** Types – Chain polymerization – Free radical polymerization, Ionic polymerization, coordination polymerization. Step Polymerization – polycondensation, poly addition, ring opening. Miscellaneous polymerization reactions – electrochemical. Group transfer polymerization. (9 hours)

### UNIT-II

#### Polymer properties and Reactions

**Molecular weight and Size:** Average molecular weight - number average - weight average molecular weights – concepts. Sedimentation and viscosity Average molecular weights - Molecular weight and degree of polymerization.

**Glass Transition Temperature (T<sub>g</sub>):** Definition, Transition and Associated properties, Factors influencing the glass transition temperature. Photo oxidative degradation of polymers. (9 hours)

### UNIT-III Polymerization Techniques and Processing

**Polymerization techniques:** Bulk, Solution, Suspension, Emulsion and Interfacial poly condensation polymerization.

**Polymer Processing:** Introduction – plastic, elastomers and fibers. Processing Techniques- Calendaring – Die Casting – Rotational Casting – Film Casting – compression moulding – injection Moulding.

(9 hours)

### UNIT-IV Chemistry of Commercial Polymers

**General methods of preparations, Properties and uses of the following polymers:** Polystyrene, polymethylmethacrylate, polyesters, polyamides (Kevlar), Polyurethanes, Poly vinyl Chloride, Phenol Formaldehyde resin, Urea Formaldehyde resins, Epoxy resins, Teflon. (9 hours)

**UNIT-V Recent Advances in Polymers**

**Biopolymers:** Cellulose – Rayon – Cellophane, Cellulose Nitrate – Carboxy Methyl cellulose. Silicones.

**Applications of polymers:** Biomedical applications, Drug delivery, artificial organs, Electronic Applications - Conducting polymers with examples. (9 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

**TEXT BOOK**

3. V. R. Gowariker, N.V. Viswanathan and Jayadev Sreedhar, (2012) **Polymer Science**, Revised Edition, New Age International Publishers, New Delhi.

**REFERENCE BOOKS**

4. F.W. Billmeyer – (1990) **Text Book of Polymer Science**, John Wiley & Sons.

5. J.R. Fried, (2004) **Polymer Science & Technology**, Prentice Hall of India Private Ltd.

6. G.S. Misra, (1997) **Introductory Polymer Chemistry**, New Age International Private Ltd, New Delhi.

4. Sharma. B.K., GOEL Publishing House, Meerut,( 1989) **Polymer Chemistry**.

5. Arora. M.G., Singh. M, and Yadav. M.S., (1989) **Polymer Chemistry**, Anmol Publications Private Ltd., New Delhi.

**MAPPING**

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<b>CO1</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

**SEMESTER - III**

**PART IV -NON MAJOR ELECTIVE –I HUMAN RIGHTS**

**Total Hours: 30**

**Total Credits : 2**

**Objectives:**

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

**UNIT – I**

Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

**UNIT – II**

United Nations Charter and Human Rights - U.N.Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

**UNIT – III**

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

**UNIT – IV**



## UCH 86

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights.

### UNIT – V

Rights of Women, Child, Refugees and Minorities - Media and Human Rights - NGO's in protection of Human Rights - Right to Election

#### Text Books

##### 1. Human Rights

Compiled by Dr.V.Sugantha, Dean(Unaided),  
Kongunadu Arts and Science College,  
Coimbatore –29.

#### Book for Reference:

##### 1.Human Rights, Humanitarian Law and Refugee Law

Jaganathan,MA.,MBA.,MMM.,ML.,ML.,  
J.P.Arjun Proprietor,Usha Jaganathan  
law series, 1<sup>st</sup> floor, Narmatha Nanthi Street,  
Magathma Gandhi Nagar, Madurai – 625014.

##### 2. Promoting Women's Rights As Human Rights

Publisher : United Nations.  
New York., 1999.

#### Question Paper Pattern (External only)

Duration: 3 hrs

Max: 75 marks

##### Section A (5x5=25)

Short notes

Either – Or/ Type - Question from each unit

##### Section B (5X10=50)

Essay type

Either – Or/ Type - Question from each unit

**SEMESTER-IV**

**NON MAJOR ELECTIVE-II WOMEN'S RIGHTS**

**Total Hours: 30**

**Total Credits: 2**

**OBJECTIVES:**

- To know about the laws enacted to protect women against violence.
- To impart awareness about the hurdles faced by women.
- To develop a knowledge about the status of all forms of women to access to justice.
- To create awareness about women's rights.
- To know about laws and norms pertaining to protection of women.
- To understand the articles which enables the women's rights.
- To understand the Special Women Welfare laws.
- To realize how the violence against women puts an undue burden on health care services.

**Unit I**

**6hrs**

**Laws, Legal System & Change**

Definition- Constitutional law, CEDAW and international human rights-law and norms-laws and social context-constitutional and legal frame.

**Unit II**

**6hrs**

**Politics of Land and Gender in INDIA**

Introduction-faces of poverty-land as productive resources-locating identities-women's claim to land –rights of properties-case studies.

**Unit III**

**6hrs**

**Women's Rights: Access to Justices**

Introduction-criminal law-crime agent women-domestic violence-dowry related harassment and dowry deaths-molestation-sexual abuse and rape-loopholes in practice-laws enforcement agency.

**Unit IV**

**6hrs**

**Women's Right**

Violence against-women-domestic violence-the protection of women from domestic violence act, 2005-The Marriage Validation Act, 1982-The Hindu Widow Re-marriage Act, 1856 - The Dowry Prohibition Act, 1961.

**Unit V**

**6hrs**

**Special Women Welfare Law**

Sexual harassment at work place-rape and indecent representation-the indecent representation act, 1956-acts enacted for women development and empowerment-role of rape crisis center.

**Book for study :** Published by Kongunadu Arts & Science College, 2011.

**Books for reference:**

1. Good Women do not Inherit land Nitya Rao, Social Science Press and Orient Blackswan (2008).
2. Knowing Our Rights An Impart for Kali for Women (2006). International solidarity network.
3. Women Rights P.D.Kaushik, Bookwell Publications (2007).
4. Violence Protective Measures for Aruna Goal, Women Development and Empowerment Deep and Deep Publications Pvt. (2004).
5. Gender Justice Monika Chawla, Deep and Deep Publications Pvt. (2006).
6. Domestic Violence Against Women Preeti Mishra, Deep and Deep Publication Pvt. (2007).
7. Violence against Women Clair M. Renzetti, Jeffrey L. Edleson, Raquel Kennedy Bergen, Sage Publications (2001).

**Question paper pattern**

**(External Only)**

**Duration: 3 hrs**

**Max: 75 Marks**

**Section A (5 x 5=25)**

Short notes

Either – or / type – question from each unit.

**Section B (5 x 10=50)**

Essay type

Either – or / type – question from each unit.

SEMESTER VI

18UCH6Z1

<b>Programme:</b> B.Sc.,		<b>Title:</b> Chemistry		
		<b>Title: Project</b>		
Batch 2018-2019		Hours / Week 3	Total Hours 45	Credits 5

## MARKS DISTRIBUTION

	Marks
Project Report	60
Viva-Voce	20
Internal	20
Total	100

**Job Oriented Course (JOC) - TEXTILE CHEMISTRY**

**Course Objectives**

1. To know about manufacture and properties of natural fibres (vegetable fibres, animal fibres) and synthetic fibres.
2. To learn preparatory process before dyeing.
3. To know the principles of bleaching and dyeing.

**Course Outcomes (CO)**

K1, K2	CO1	Gain the knowledge about both synthetic and natural fibres.
K3, K4,	CO2	Understand about scouring and desizing.
K2, K4	CO3	Learn about bleaching.
K2, K3	CO4	Basic ideas about dyeing.

**UNIT I**

***Vegetable Fibres And Animal Fibres***

Definition –classification of textile fibres- essential and desirable properties of textile fibres-Cotton fibre –Physical and Chemical properties, Jute –Purification; physical and chemical properties of jute, silk and wool. (9 hours)

**UNIT II**

***Regenerated And Synthetic Fibres***

Rayon –different types of rayon and their sources-manufacture of viscose rayon- physical and chemical properties- acetate rayon –manufacture –properties, enprammonium rayon – manufacture and properties. Manufacture – properties and uses of polyamides- polyester- polypropylene and polyacrylonitrile. (9 hours)

**UNIT III**

***Preparatory Process Prior To Dyeing***

## UCH 91

Scouring: Objective of scouring –process of caustic scouring on open kier machine with sine diagram, scouring with NaOH and Na<sub>2</sub>CO<sub>3</sub> -Precautions to be taken before scouring. Desizing using malt extract-merits and demerits of acid and enzyme desizing Singeing –Impurities present in grey cotton and cotton fabric –objects of singeing –process of singeing on gas singeing machine –precautions to be taken during gas singeing. (9 hours)

### UNIT IV

#### *Principles of Bleaching*

Principles of wetting and mechanism of detergency –synthetic detergents –surface active agents-bleaching processes –bleaching agents-H<sub>2</sub>O<sub>2</sub>, NaOCl, bleaching powder and bio-bleaching and their properties-bleaching of cotton, rayon, wool and synthetic fibres. (9 hours)

### UNIT V

#### *Principles of Dyeing*

Colour and chemical constitution –Chromophore and auxochromes-natural and synthetic dyes-dyes –classification, synthesis of dye shift- congo red, bismark brown and erifstal violet, theories of dyeing –effect of temperature and salt on dyeing –dyeing of wool, silk and poly-esters-dyeing of cotton with reactive dyes- fastness properties –washing, light, rubbing and perspiration. (9 hours)

### TEXT BOOKS

1. Shenai. V.A., (1991) **Chemistry of Dyes and Principles of Dyeing Vol. II**, Mahajan Publishers, Ahmedabad.
2. Gopalakrishnan. R. (1988) **Textile Fibres SSM**, Institute of Textile Technology, Mahajan Publishers, Ahmedabad.

### REFERENCE BOOKS

1. Shenai. V.A. (1991) **Textile Fibres (Vol. I)**, Mahajan Publishers, Ahmedabad.
2. Shenai. V.A., (1998) **Technology of Beaching**, Mahajan Publishers, Ahmedabad.

### MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	S	S	S	M
CO2	H	S	S	S	M
CO3	H	S	S	S	M
CO4	H	S	S	S	H

S – Strong

H – High

M – Medium

L – Low

18UCH1A1/18UCH2A1

<b>Programme:</b> B.Sc.,		<b>Title:</b> Bio Technology (I Year), Physics (II year), Botany (II Year), Bio-Chemistry (II Year)		
<b>Course Code:</b> 18UCH1A1/18UCH2A1		<b>Title:</b> ALLIED CHEMISTRY PAPER - I		
Batch	Semester	Hours / Week	Total Hours	Credits
2018-2019	I/III	4	60	4

**Course Objectives**

1. To understand the fundamentals of Chemical bonding.
2. To study Hybridizations, asymmetry and optical activity of organic molecules.
3. To study the basic principles of thermodynamics and electrochemistry.

**Course Outcomes (CO)**

K1,K2	CO1	Understanding the fundamental aspects of chemical bonding and interhalogen compounds.
K1,K2	CO2	Learn about the fundamental aspects of Hybridization, stereochemistry which includes asymmetric carbon, optical isomerism, resolution and Geometrical isomerism.
K2, K4	CO3	Study on the various concepts in Thermodynamics and electrochemistry.
K1, K3	CO4	Acquiring knowledge about Fuel gases and fertilizers.

**UNIT-I**

**Concepts of Chemical bond**

1. Chemical Bonding - Molecular orbital theory- bonding, anti bonding and non - bonding molecular orbitals - Energy order of MO's - Diamagnetism and Para magnetism - Bond order -Molecular orbital configuration of H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub>.
2. Inter halogen Compounds - Types of Inter halogen Compounds. Preparation, properties, uses and Structures of ICl, BrF<sub>3</sub> and IF<sub>5</sub>.
3. Compounds of Sulphur - Preparation, properties, uses and Structures of Sodium hydrosulphite and Peroxides of Sulphur. (12 hours)

## UNIT-II

### Hybridisation and isomerism in compounds

1. Hybridization - Hybridization of methane, ethene, acetylene, benzene -Classification of reagents - Electrophiles, nucleophiles and free radicals - Classification of reactions - Substitution, addition, elimination, isomerisation, polymerization and condensation.
2. Optical isomerism- Symmetry, elements of symmetry, cause of optical activity Optical isomerism of lactic acid and tartaric acid - Racemisation, Resolution.
3. Geometrical isomerism of maleic acid and fumaric acid. (12 hours)

## UNIT-III

### Energetics

Introduction - Scope and limitations - Basic terms - system, surroundings - Types of system, state of system, state variables. Thermodynamic processes - Isothermal, Adiabatic, Isobaric, Isochoric and cyclic processes - Reversible and irreversible processes - Spontaneous process. First law of thermodynamics - Mathematical formulation-limitations. Need for Second law - various statements of second law. Joule - Thomson effect. Enthalpy - Free energy change. (12 hours)

## UNIT-IV Electrochemistry

Introduction - Electrolysis - Conductance of electrolytes - Specific conductance, equivalent conductance, molar conductance - Kohlrausch law - Applications - Determination of degree of dissociation - Conductometric titrations. Buffer Solutions and pH: Buffer solutions- buffer action - Determination of pH of buffer solutions - Buffer solutions in living systems. pH definition - Determination by Colorimetric (indicator) method and electrometric method (Conductometric) only. Principles of electroplating and its uses. (12 hours)

## UNIT-V

### Industrial Chemistry

1. Fuel gases - Qualities of good fuel. Advantages of gaseous fuels over solid and liquid fuels. Short accounts of natural gas, water gas, semi water gas, carburetted water gas, producer gas and oil gas (manufacturing details not required).
2. Fertilizers - Role of the nutrient elements Nitrogen, Phosphorus and Potassium in plants. Qualities of good Fertilizer, Short accounts of ammonium sulphate, Urea, CAN, Calcium super phosphate, Triple super phosphate and Potassium nitrate (manufacturing details not required). (12 hours)

*\*self study portion*

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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### TEXT BOOKS

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi,
2. Gurdeep. R. Chatwal,(2013) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi



## UCH 94

3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi

### REFERENCE BOOKS

1. M.G Arora, (2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi.
2. Jagdamba Singh and Yadav,(2005) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers.
3. I.L.Finar, (2009) **Organic Chemistry**,Vol.I and II, Addison-Wesley Longman.

18UCH1A1/18UCH2A1

### MAPPING (Physics)

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	M	M	M
CO2	S	H	M	H	M
CO3	S	M	M	M	M
CO4	S	H	H	H	H

S – Strong

H – High

M – Medium

L – Low

### MAPPING (Bio-Chemistry)

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	M	M	M
CO2	S	M	M	H	H

### UCH 95

<b>CO3</b>	S	M	M	H	M
<b>CO4</b>	S	H	H	H	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

### MAPPING (Botany)

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	M	M
<b>CO2</b>	S	H	M	H	H
<b>CO3</b>	S	M	H	H	M
<b>CO4</b>	S	H	H	H	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

### MAPPING (Bio – technology)

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	H	M	H	M
<b>CO4</b>	S	H	H	M	H



<b>Programme:</b> B.Sc.,		<b>Title:</b> Bio Technology(I Year), Physics(II year), Botany(II Year), Biochemisrty(II year)		
<b>Course Code:</b> 18UCH1A2/18UCH2A2		<b>Title:</b> ALLIED CHEMISTRY PAPER - II		
Batch 2018-2019	Semester II/IV	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To know the fundamentals of Coordination compounds.
2. To learn about some natural products, amino acids and proteins.
3. To study about chemical kinetics and synthetic polymer.

### Course Outcomes (CO)

K1,K2	CO1	Understanding the fundamental aspects and applications of coordination chemistry.
K1,K2	CO2	Study on the various heterocyclic compounds, carbohydrates and amino acids which include their classification, preparation and properties.
K2, K4	CO3	Know about the rates of the reaction.
K1, K3	CO4	Acquire the knowledge about of synthetic polymers, fibres and plastics.

### UNIT-I

#### Coordination compounds

1. Addition compounds - double salts and complexes.
2. Complexes (Mononuclear complexes only)
  - (i) General aspects- central metal atom, Ligand- types of ligands. Coordination number of central metal atom, oxidation number of central metal atom – Nomenclature (IUPAC system)
  - (ii) Theories of Complexes - Werner's theory, Sidgwick theory - EAN, EAN rule, Pauling's theory - Diamagnetic and paramagnetic complexes- explanation with four and six coordination complexes.
  - (iii) Chelation- Meaning, examples, EDTA applications.
  - (iv) Biological role of Hemoglobin and Chlorophyll
  - (v) Applications of complexes in qualitative and quantitative analysis. (12 hours)

### UNIT-II Chemistry of Natural Products

1. Heterocyclic compounds – Nomenclature - Preparation - Properties and uses of Furan, Thiophene, Pyrrole and Pyridine. Comparison of the basicities of Pyrrole and Pyridine with amines.
2. Carbohydrates- Classification - Preparation and reactions of glucose and fructose - Inter conversion of glucose to fructose and vice versa. (12 hours)

**UNIT-III****Amino acids**

1. **\*Amino acids – Classification** - Preparation - Gabriel Phthalimide synthesis, Strecker synthesis, Amination of  $\alpha$  - halo acid-properties.
2. Preparation of Peptides - Bergmann method.
3. Nucleic acids - DNA, RNA their components and biological function. (12 hours)

**UNIT-IV**

**Chemical Kinetics** - Rate of chemical reaction - units of rate - Factors influencing rate of a reaction -rate equation - rate laws - Rate constant- unit of rate constant - Determination of rate constant of a reaction. Order of a reaction - integrated rate expression for first, second and zero order reactions - examples. Determination of order of reactions - Integrated method, Half - life method, Graphical method, Oswald's method. Molecularity of a reaction - Pseudo unimolecular reaction- Difference between order and molecularity of a reaction. (12 hours)

**UNIT-V**

**Synthetic polymers** – Nomenclature, Types of polymers – Addition and condensation polymerization.

**Synthetic fibers** – *\*Important requirement of a fiber* , difference between natural and synthetic fiber, properties of synthetic fiber, Preparation of nylon 6 and nylon 6,6.

**Synthetic plastics** – Classification , thermosetting and thermoplastic plastics – differences, properties. (12 hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. Arun Bahl and B.S.Bahl,(2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi,
2. Gurdeep. R. Chatwal, (2013) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi
3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi,

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1. M.G Arora,(2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi
2. Jagdamba Singh and Yadav,(2005) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers, 1<sup>st</sup> Edition.
3. I.L.Finar,(2009) **Organic Chemistry**,Vol.I and II, Addison-Wesley Longman.

**MAPPING (Physics)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	H	M	H	M
<b>CO4</b>	S	H	H	M	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

**MAPPING (Bio-Chemistry)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	M	H	M	H
<b>CO3</b>	S	H	H	H	M
<b>CO4</b>	S	H	H	M	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

**MAPPING (Botany)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	M	H	H
<b>CO2</b>	S	S	H	M	H
<b>CO3</b>	H	H	H	H	M
<b>CO4</b>	S	H	H	M	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

# UCH 100

## MAPPING (Bio – technology)

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	H	M	H	M
<b>CO4</b>	S	H	H	M	H

<b>Programme:</b> B.Sc.,		<b>Title:</b> Bio Technology(I Year), Physics(II year), Botany(II Year), Biochemisrty(II year)		
<b>Course Code:</b> 18UCH2AL/18UCH4AL		<b>Title: ALLIED CHEMISTRY PRACTICAL – I VOLUMETRIC AND ORGANIC ANALYSIS</b>		
Batch 2018-2019	Semester I & II/III & IV	Hours / Week 3	Total Hours 90	Credits 2

### Course Objectives

1. To demonstrate the basic laboratory technique of titration.
2. To gain deep knowledge about analysis of organic substances.
3. To identify the functional groups of unknown compounds.

### Course Outcomes (CO)

K1,K2	CO1	Remember the basics of volumetric titrations.
K2,K3	CO2	Studying the use of indicators for various titrations.
K2	CO3	Understanding about preliminary analysis of organic compounds.
K4	CO4	Identification of the functional groups.

### Volumetric Analysis

1. Estimation of Sodium hydroxide using standard Sodium Carbonate Solution
2. Estimation of Hydrochloric acid-standard Oxalic acid
3. Estimation of Oxalic acid- Standard sulphuric acid.
4. Estimation of ferrous Sulphate –Standard Mohr salt solution.
5. Estimation of Oxalic acid- Standard ferrous Sulphate solution.
6. Estimation of Potassium permanganate- Standard sodium hydroxide solution

### Organic Analysis

1. Detection of elements (N, S, Halogens).
2. To distinguish between Aliphatic and Aromatic.
3. To distinguish between Saturated and unsaturated.
4. Functional group test for Phenol, acids, (mono and di), aromatic primary amine, amide (mono and di), dextrose.
5. Systematic analysis of Organic compounds containing one functional group and characterization by confirmatory tests.

### REFERENCE BOOKS

1. V. Venkateswaran, R. Veeraswamy, A.R. Kulandaivelu,(1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. N. S. Gnanapragasam and G. Ramamoorthy, (2006) Organic Chemistry Lab manual, S. Viswanathan Private Limitad, Chennai.



## UCH 102

Time - 3 Hours

Max. Marks: 30

### Distribution of Total Marks 30

Record	5
Volumetric	12
Organic Analysis	13

### Distribution of Volumetric - 12 Marks

Error up to 2%	12
3%	9
4%	5
>4%	2

- ❖ Reduce 1 mark for each arithmetic error
- ❖ For wrong or no calculation, reduce 25% of the marks awarded. (Here, the examiners have to do the calculation and then, have to award marks)

### Distribution of Organic Analysis - 13 Marks

Preliminary Tests	- 3
Aliphatic / Aromatic	- 2
Saturated / Unsaturated	- 2
Special elements	- 3
Functional group	- 3

18UCH2AL/18UCH4AL

### MAPPING (Physics)

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	S	S	H	H	H
CO3	S	H	M	H	M
CO4	S	H	H	M	H

S – Strong

H – High

M – Medium

L – Low

## UCH 103

### MAPPING (Bio-Chemistry)

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	S	M	H	M	H
CO3	S	H	H	H	M
CO4	S	H	H	M	M

S – Strong

H – High

M – Medium

L – Low

### MAPPING (Botany)

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	M	H	H
CO2	S	S	H	M	H
CO3	H	H	H	H	M
CO4	S	H	H	M	H

S – Strong

H – High

M – Medium

L – Low

### MAPPING (Bio – technology)

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	M
CO2	S	S	H	H	H
CO3	S	H	M	H	M
CO4	S	H	H	M	H