

SEMESTER II

UCCHC20- PRACTICAL I: INORGANIC QUALITATIVE ANALYSIS

Year : I	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
SEM :II	UCCHC20	Inorganic Qualitative Analysis	Practical	Core	3	4	100

Course Outcomes

The Learners will be able to

1. Recall the principles of inorganic qualitative analysis.
2. Apply the concepts of semimicro analysis in inorganic qualitative analysis.
3. Develop skill to analyse systematically the given inorganic mixture and identify the acid and basic radicals.
4. Understand the importance of eliminating the interfering radical.
5. Eliminate the interfering acid radical for group separation and identification of basic radicals.

CO	PSO					
	1	2	3	4	5	6
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

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

Reactions of the following anions to be analysed:

carbonate, sulphide, sulphate, fluoride, chromate, bromide, chloride, nitrate, oxalate, phosphate and borate.

Reactions of the following cations to be analysed:

Lead, copper, cadmium, bismuth, aluminium, iron, manganese, zinc, cobalt, nickel, calcium, strontium, barium, magnesium and ammonium.

Text Books:

1. Departmental Under Graduate Laboratory Manual.
2. Dr. V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis, National Publishing Company.

Reference Books:

1. Dr. O. P. Pandey, D. N. Bajpai, Dr. S. Giri, Practical Chemistry, S. Chand Ltd., Revised Edition, 2013.
2. Vogel's Text book of Qualitative Inorganic Analysis, Pearson, 7th Edition, 2012.

OER:

1. [https://amrita.olabs.edu.in/?sub=73&brch=7&sim=180&cnt=515\(Analysisof anions\)](https://amrita.olabs.edu.in/?sub=73&brch=7&sim=180&cnt=515(Analysisof anions))

2. <http://amrita.olabs.edu.in/?sub=73&brch=7&sim=31&cnt=1> (Analysis of cations)
3. <http://web.mst.edu/~gbert/qual/qual.html> (Analysis of cations)
4. <https://nroer.gov.in/55ab34ff81fccb4f1d806025/file/58664a1e472d4a6379bd98a5> (Analysis of anions)
5. <https://nroer.gov.in/55ab34ff81fccb4f1d806025/file/58664a74472d4a6379bd98c7> (Analysis of cations)

Continuous Assessment - 40 marks

I CA - 50

II CA - 50

Average - 25

Performance during regular practicals - 10

Regularity in submission of observation note-book and record – 5

Semester Practical Examination - 60 marks

Viva-Voce - 5

Record - 10

Qualitative Analysis - 45

Simple Acid Radical - 8

Eliminating Radical - 10

Each Basic Radical - 9 (9 x 2 = 18)

Other tests - 9

Total - 100

(Note: For each radical spotting - 2 marks)

SEMESTER III

USCHA320 - SKILL BASED ELECTIVE: INDUSTRIAL CHEMISTRY

Year: II SEM:III	Course Code USCHA320	Title of the Course Industrial Chemistry	Course Type Theory	Course category Skill Based Elective	H/W 2	Credits 2	Marks 100
-----------------------------------	---------------------------------------	--	------------------------------	--	-----------------	---------------------	---------------------

Learning Objectives:

1. To acquire an in depth knowledge on various areas of industrial chemistry like polymers, leathers, textile, fuels, glasses, ceramics, cements and paints.
2. To help the students enhance the reasoning skills and understand the working of industrial processes.

Course Outcomes:

The Learners will be able to

1. Discuss the composition, characteristics and manufacture of various industrial products. (Polymer, Leather, Textile, Glass, Ceramics, Cements, Paints and Pigments).
2. Explain the various process involved in the manufacture of leathers and leather products.
3. Describe the importance of natural and synthetic fibres in textile industry.
4. Understand the classifications of fuels and learn the common terms related to it.
5. Understand how to implement the concepts in industrial working environment.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H
CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H

CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

Unit I: (6 Hours)

- 1.1 Introduction- terms involved in polymers. (K1 & K2)
- 1.2 Classification of polymers. (K1, K2 & K3)
- 1.3 Polymerization, types of polymerization. (K1, K2 & K3)
- 1.4 Preparation, properties and uses of natural polymers. (K1 & K2)
- 1.5 Preparation, properties and uses of synthetic rubber- polyvinyl chloride, polyester, polyamide. (K1, K2 & K3)
- 1.6 Biodegradable polymers. (K1 & K2)

Unit II: (6 Hours)

- 2.1 Introduction-constituent of animal skin. (K1 & K2)
- 2.2 Preparation of hides for tanning. (K1 & K2)
- 2.3 Process - cleaning and soaking, liming and unhairing, deliming, bating and pickling. (K1, K2 & K3)
- 2.4 Leather tanning-vegetable and chrome tanning. (K1, K2 & K3)
- 2.5 Finishing process- dyeing and fat liquoring. (K1, K2 & K3)
- 2.6 Cleaner processing and practices in beam house, Effluent treatment (K1, K2 & K3)

Unit III: (6 Hours)

- 3.1 Introduction to textile fibres-Classification of textile fibres. (K1 & K2)
- 3.2 Differences between natural and synthetic fibres. (K1 & K2)
- 3.3 Synthetic fibres- Preparation and properties of Rayon and Nylon. (K1, K2 & K3)
- 3.4 Textile chemical processing for the fibres-Singeing, de-sizing, scouring, bleaching, mercerization. (K1, K2, K3 & K4)
- 3.5 Textile dyes- difference between pigments and dyes. (K1 & K2)
- 3.6 Classification of dyes- vat dyes, Azo dyes, chrome dyes, Acid and base dyes. (K1 & K2)

Unit IV: (6 Hours)

- 4.1 Introduction- Classification of fuels. (K1 & K2)
- 4.2 Solid fuel-coal and coke- composition and properties. (K1 & K2)
- 4.3 Liquid fuel- Petroleum processing and fractions, Biofuels.(K1 & K2)
- 4.4 Cracking- catalytic cracking and methods-Knocking- octane number and cetane number. (K1, K2 & K3)
- 4.5 Synthetic petrol-Fischer Tropsch and Bergius processes. (K1, K2 & K3)
- 4.6 Fuel gases- Natural gas and Water gas. (K1 & K2)

Unit V: (6 Hours)

- 5.1 Glass- Raw materials- characteristics. (K1 & K2)
- 5.2 Methods of Manufacture- melting, shaping, annealing, finishing- special glasses. (K1, K2 & K3)
- 5.3 Refractories- characteristics, classification and properties. (K1 & K2)
- 5.4 General methods of manufacture of refractories. (K1, K2 & K3)
- 5.5 Cement- composition, setting of cement- crystalline and colloidal theory. (K1, K2 & K3)
- 5.6 Paints and pigments- Constituent of paints, pigments- white lead, ultramarine, Chrome yellow. (K1, K2 & K3)

References:

- 1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2016.
- 2. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co, New Delhi, 1981.
- 3. P.C. Jain, Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Co (P) Ltd, 2018.
- 4. K. Sessa Maheswaramma, Mridula Chugh, Engineering Chemistry, Pearson Education India, 2016.
- 5. Thomas Bechtold, Tung Pham, Textile Chemistry, Walter de Gruyter GmbH & Co, 2019.
- 6. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, S.Chand and Company Ltd., Reprint 2013.

Open Educational Resources (OER):

- 1. <https://plastics.americanchemistry.com/How-Plastics-Are-Made/>
- 2. <http://wwwchem.uwimona.edu.jm/courses/CHEM2402/Textiles/Leather.html>
- 3. <http://www.petroleum.co.uk/>
- 4. <https://nios.ac.in/media/documents/313courseE/L34A.pdf>

SEMESTER IV**UCCHF20 – PRACTICAL II: VOLUMETRIC ESTIMATION**

Year: II	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	UCCHF20	Volumetric Estimation	Practical	Core	3	4	100

Course Outcomes:

The Learners will be able to

- 1. Use double titration method in volumetric analysis.
- 2. Prepare standard solutions.
- 3. Apply volumetric principles to carry out acid-base titrations, complexometric titrations, precipitation titration and redox titrations like permanganometric, dichrometry and iodometric titrations.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	M	M	H
CO2	H	H	H	M	M	H
CO3	H	H	H	M	M	H

Acidimetry

1. Estimation of sodium hydroxide- standard sodium carbonate
2. Estimation of borax-standard sodium carbonate

Permanganometry

3. Estimation of oxalic acid- standard Mohr's salt or ferrous sulphate
4. Estimation of sodium nitrite- standard oxalic acid
5. **Estimation of Calcium
6. **Determination of percentage of Manganese dioxide in Pyrolusite

Iodometry

7. Estimation of copper-standard copper sulphate
8. Estimation of potassium dichromate- standard potassium dichromate

Complexometry

9. Estimation of magnesium using EDTA
10. Estimation of nickel using EDTA
11. *Estimation of temporary and permanent hardness of water

Dichrometry

12. Estimation of ferrous ion using diphenylamine/ N-phenyl anthranilic acid as indicator

Precipitation titration

13. *Estimation of chloride in neutral medium

* & **Not to be given for examination.

** To be given as a group experiment.

Continuous Assessment - 40 marks

I C.A.	- 50
II C.A.	- 50
Average	- 25
Performance during regular practicals	-10
Regularity in submission of observation note-book and Record	- 5

Semester Practical Examination - 60 marks

Short Procedure writing	- 5
Viva-voce	-5
Record	-10

Volumetric Analysis:

≤ 2%	- 40 marks
> 1 upto 2%	- 35 marks
>2 upto 3%	- 25 marks
>3 upto 4%	- 15 marks
> 4%	- 10 marks

Reference Books:

1. A. I. Vogel, Vogel's Textbook of Quantitative Chemical Analysis, 5th Edition, Longman Scientific & Technical, 1989.
2. Peter A C McPherson, Practical Volumetric Analysis, 4th Edition, Cambridge: The Royal Society of Chemistry, 2015.

Open Educational Resources (OER):

1. <http://rohmatchemistry.staff.ipb.ac.id/files/2015/07/vogels-textbook-of-quantitative-chemical-analysis.pdf>

SEMESTER 1V

USCHB420 - SKILL BASED ELECTIVE: AGRICULTURAL CHEMISTRY

Year: II	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	USCHB420	Agricultural Chemistry	Theory	Skill Based	2	2	100

Learning Objectives:

1. To impart elementary ideas of soil chemistry, types of farming, insecticides, fungicides and herbicides.

2. To emphasize the importance of fertilizers.

Course Outcomes:

The Learners will be able to

1. Understand the scope of agriculture in India and Tamil Nadu.
2. Explain the physical and chemical properties of soil.
3. Describe the types of farming.
4. Summarize the certification of organic products.
5. Identify the benefits and adverse effects of pesticides.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

Unit I: (6 Hours)

- 1.1 Agriculture – Definition – Scope of agriculture in India and Tamil Nadu. (K1 & K2)
- 1.2 Branches of agriculture. (K1 & K2)
- 1.3 Agronomy – Art, Science and business of crop production. (K1 & K2)

- 1.4 Agronomical classification of crops - their importance. (K1 & K2)
- 1.5 Major crops of India and Tamil Nadu, Water resources in Tamil Nadu. (K1 & K2)
- 1.6 Factors affecting crop production – Moisture, aeration, light, temperature and nutrients. (K1 & K2)

Unit II:(6 Hours)

- 2.1 Soil chemistry – Introduction, soil classification and survey. (K1 & K2)
- 2.2 Properties of soil – soil texture and soil water. (K1 & K2)
- 2.3 Soil temperature and soil colloids. (K1 & K2)
- 2.4 Soil minerals and soil pH. (K1 & K2)
- 2.5 Soil acidity – alkalinity and buffering soil. (K1 & K2)
- 2.6 Soil fertility and soil formation. (K1 & K2)

Unit III: (6 Hours)

- 3.1 Farming – types – subsistence farming and commercial farming. (K1 & K2)
- 3.2 Plantation farming, mixed farming and conventional farming. (K1 & K2)
- 3.3 Organic farming, poultry farming and dairy farming. (K1 & K2)
- 3.4 Advantages of organic farming- limitation of organic farming. (K1 & K2)
- 3.5 Certification of organic products – OFAI organic labeling system. (K1 & K2)
- 3.6 Research findings on organic food. (K1 & K2)

Unit IV: (6 Hours)

- 4.1 Insecticides, Fungicides and Herbicides - Introduction. (K1 & K2)
- 4.2 Methods of using pest controls. (K1 & K2)
- 4.3 Insecticides – Arsenic compounds, fluorine compounds and boron compounds. (K1 & K2)
- 4.4 Insecticides- mercury compounds, copper compounds and sulphur compounds. (K1 & K2)
- 4.5 Modern insecticides – some important herbicides -Rodenticides. (K1 & K2)
- 4.6 Benefits of Pesticides, Adverse environmental effects of Pesticides. (K1 & K2)

Unit V: (6 Hours)

- 5.1 Fertilizers – Classification- Examples of fertilizers. (K1 & K2)
- 5.2 Nitrogenous fertilizers- phosphate fertilizers- potash fertilizers. (K1 & K2)
- 5.3 Ill effects of fertilizers. (K1 & K2)
- 5.4 Manures, compost and saw dust. (K1 & K2)
- 5.5 Farmyard manure, compost, reinforcing manure and green manure. (K1 & K2)
- 5.6 Sewage and sludge - biogas production. (K1 & K2)

References:

1. Sankaran, S. and V.T. Subbiah Mudaliar. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore. 1997
2. Principles and Practices of Agronomy. Agrobios. Jodhpur - 342 002.
3. Jayashree Ghosh. Fundamental Concepts of Applied Chemistry. S. Chand Publishing Ltd.,

2006.

4. Kirpal Singh. Chemistry in Daily life 1st Edition, Prentice Hall of India Pvt. Ltd., 2008.

Open Educational Resources (OER):

1. <https://nptel.ac.in/courses/126/105/126105016/>
2. <https://nptel.ac.in/courses/126/105/126105016/>
3. <https://nptel.ac.in/content/storage2/courses/103107086/module1/lecture1/lecture1.pdf>
4. <https://nptel.ac.in/courses/126/105/126105014/>

SEMESTER V

USCHC520-SKILL BASED ELECTIVE: SMALL SCALE CHEMISTRY

Year: III SEM: V	Course Code USCHC520	Title of the Course Small Scale Chemistry	Course Type Theory	Course Category Skill Based Elective	H/W 2	Credits 2	Marks 100
-----------------------------------	--------------------------------	---	------------------------------	--	-----------------	---------------------	---------------------

Learning Objectives:

1. To impart knowledge on small-scale industries.
2. To acquire skills in the manufacture of various small-scale products.

Course Outcomes:

The Learners will be able to

1. Understand the laws, role and steps involved in starting small scale industries.
2. Acquire skills to prepare soaps and detergents.
3. Describe the characteristics and uses of cosmetics and perfumes.
4. Gain skills in the manufacture of selected small-scale products.

CO	PSO					
	1	2	3	4	5	6
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H

Unit I: Small - Scale Industry

- 1.1.Objectives and characteristics of small-scale industries (K1& K2)
- 1.2. Types of SSI, role of SSI in Indian economy. (K1& K2)
- 1.3. Steps in starting SSI (K1& K2)
- 1.4. Laws for SSI, Problems of SSI (K1& K2)
- 1.5. Finance management, Quality control – definition and advantages. (K1& K2)
- 1.6.Marketing and branding, Advertising – definition, objectives, advertising media.(K1 &K2)

Unit II: Soaps and Detergents

- 2.1. Soaps- definition, fatty and non- fatty raw materials.(K1& K2)
- 2.2. Types of soaps, manufacture of laundry soap and bathing soap. (K1& K2)
- 2.3. Mechanism of cleansing action of soap.(K1& K2)
- 2.4. Composition, preparation and advantages of herbal soaps. (K1& K2)
- 2.5. Detergents - classification of surfactive agents (LABSA), manufacture of detergents. (K1& K2)
- 2.6. Shampoo – composition and manufacture of egg and herbal shampoo, anti-dandruff and conditioners.(K1& K2)

Unit III: Cosmetics and Perfumes

- 3.1. Cosmetics – definition and history.(K1& K2)
- 3.2. Kinds of cosmetics. (K1& K2)
- 3.3. Preparation of face powder, face cream and lipstick.(K1& K2)
- 3.4. Perfumes - definition, essential ingredients in perfumes.(K1& K2)
- 3.5. Classification of essential oils.(K1& K2)
- 3.6. Preparation of perfumes.(K1& K2)

Unit IV: Miscellaneous Small-Scale Products

- 4.1. Camphor – production, biosynthesis and applications. (K1& K2)
- 4.2. Bleaching powder – preparation, properties and uses. (K1& K2)
- 4.3. Biogas- composition, production and uses.(K1& K2)

- 4.4. Handmade paper from bagasse- composition of bagasse and uses.(K1& K2)
 4.5. Asofoetida – composition, cultivation, manufactures and uses.(K1& K2)
 4.6. Composition and manufacture of safety matches and agarbattis.(K1& K2)

Unit V: Miscellaneous Small-Scale Products

- 5.1. Recycling of synthetic organic polymers – applications of PET and PVC. (K1& K2)
 5.2. Recycling of synthetic organic polymers – applications of HDPE and polystyrene.(K1& K2)
 5.3. Reverse osmosis of water – production and applications.(K1& K2)
 5.4. Coconut oil – manufacture by dry and wet process and uses. (K1& K2)
 5.5. Vulcanization of rubber, making an eraser. (K1& K2)
 5.6. Pencils–forms of graphite, adhesion and lengthwise graphitization method & uses. (K1& K2)

Reference Books:

1. Dr. V. Balu, Entrepreneurship and Small Business Promotion, First Edition, Sri Venkateswara Publications, 2004.
2. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co. Pvt. Ltd., 1981.
3. A.N.Zamre, V.G.Ratolikar, A Textbook of Modern Applied Chemistry, M.G.Lomte Edition, S.Chand& Co., 1985.
4. Clarence Henry Eckles, Willes Barnes Combs and Harold Macy, Milk and Milk products, Tata McGraw- Hill Publishing Company, 2002.
5. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 2008.
6. H.Panda, Herbal soaps detergents Hand Book, National Institute of Industrial Research,2011.

Open Educational Resources (OER)

1. [https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_\(Organic_Chemistry\)/Lipids/Properties_and_Classification_of_Lipids/Soaps_and_Detergents\(Soaps_and_Detergents\)](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_(Organic_Chemistry)/Lipids/Properties_and_Classification_of_Lipids/Soaps_and_Detergents(Soaps_and_Detergents))
2. <https://www.pdfdrive.com/perfumes-cosmetics-and-soaps-modern-cosmetics-d157713809.html> (Perfumes, Cosmetics and Soaps e- book).

SEMESTER VI

USCHD620 - FOOD CHEMISTRY

Year: III SEM: VI	Course Code USCHD620	Title of the Course Food Chemistry	Course Type Theory	Course Category Skill Based Elective	H/ W 2	Credits 2	Marks 100

Learning Objectives:

1. To impart elementary ideas of various types of food, food additives, food poisons, food adulteration.

2. To emphasize the importance of vegetable and fruits.

Course Outcomes:

The Learners will be able to

1. Apply simple analytical techniques for detecting food adulterants.
2. Describe the role of food additives, preservatives, flavours, colours and antioxidants.
3. Detect food poisons and apply first aid techniques.
4. Distinguish between alcoholic and nonalcoholic beverages.
5. Describe the importance of saturated and unsaturated fats in edible oils and the nutritive value of fruits and vegetables.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

Unit I: (6 Hours)

- 1.1 Food and food adulteration, food types, advantages and disadvantages. (K1 & K2).
- 1.2 Food adulteration- adulteration in food grains, milk and butter. (K1 & K2)
- 1.3 Food adulteration- adulteration in ghee, ice creams and cakes. (K1 & K2)
- 1.4 Food adulteration- adulteration in pepper, turmeric and chilli powder. (K1 & K2)
- 1.5 Food adulteration- adulteration in edible oils, coffee and tea powder. (K1 & K2)
- 1.6 Detection of adulterants by simple analytical techniques, FSSAI and HACCP laws. (K1 & K2)

UnitII: (6 Hours)

- 2.1 Food additives - Definition, structure , advantages and disadvantages of artificial sweeteners – sucralose, saccharin, cyclamate and aspartate. (K1 & K2)
- 2.2 Food flavours-esters, aldehydes and heterocyclic compounds (K1 & K2)
- 2.3 Food flavours -spices - ajwain, aniseed, asafoetida, bay leaves, cardamom, cinnamon, cloves. (K1 & K2)
- 2.4 Food colours, emulsifying agents and preservatives . (K1 & K2)
- 2.5 Leavening agents- baking powder, baking soda, yeast. (K1 & K2)
- 2.6 Antioxidants- propyl gallate, butylated hydroxyl anisole and butylated hydroxyl toluene. (K1 & K2)

Unit III: (6 Hours)

- 3.1 Food poison - pesticides and chemical poisons. (K1 & K2)
- 3.2 First aid for poison consumed victims. (K1 & K2)
- 3.3 Beverages - soft drinks- soda, carbonated drinks, fruit juices. (K1 & K2)
- 3.4 Alcoholic beverages- examples and composition. (K1 & K2)
- 3.5 Addiction to alcohol- diseases of liver. (K1 & K2)
- 3.6 Deaddiction measures. (K1 & K2)

Unit IV: (6 Hours)

- 4.1 Edible oils - fats, oils, sources of oils, saturated and unsaturated fats. (K1 & K2)
- 4.2 Importance of MUFA and PUFA. (K1 & K2)
- 4.3 Iodine value, RM value, saponification values and their significance. (K1 & K2)
- 4.4 Rancidity- types, hydrolytic and oxidative. (K1 & K2)
- 4.5 Test for rancidity (K1 & K2)
- 4.6 Prevention of rancidity. (K1 & K2)

Unit V:(6 Hours)

- 5.1 Vegetables and Fruits – classification and composition. (K1 & K2)
- 5.2 Nutritive value of green leafy vegetables, roots and tubers, other vegetables. (K1 & K2)
- 5.3 Pigments- water insoluble and water soluble pigments. (K1 & K2)
- 5.4 Vegetable cookery- preparation, changes during cooking, loss of nutrients during cooking. (K1 & K2)

5.5 Fruits- classification and composition. (K1 & K2)

5.6 Ripening of fruits, chemical fruit ripening and storage of fruits. (K1 & K2)

Reference Books:

1. Lillian Hoagland Meyer, Food Chemistry, 1st Indian Edition, CBS Publishers and Distributors, 2004.
2. Norman W. Desrosier, James N. Desrosier, The technology of food preservation, 4th Indian Edition, CBS Publishers and Distributors, 1987.
3. Norman N. Potter, Joseph H. Hotchkiss, Food science, 5th Edition, CBS Publishers and Distributors, 1999.
4. Vijay Kaushik., Dietotherapy, 1st Edition, Mangal Deep Publications, 2008.
5. B.Srilakshmi, Food Science, 7th Edition, New Age International publishers, 2018.
6. Seema Yadav, Food Chemistry, 1st Edition, Anmol publications, 2006

Open Educational Resources:

1. <https://freevideolectures.com/course/4443/nptel-dairy-food-process-products-technology/7>
2. <https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod6.pdf>
3. <https://nptel.ac.in/courses/126/105/126105013/>

UCCHL20 -PRACTICAL III: PHYSICAL CHEMISTRY PRACTICAL

Year: III SEM: VI	Course Code UCCHL20	Title of the Course Physical Chemistry Practical	Course Type Practical	Course Category Core	H/W 2	Credits 4	Marks 100
------------------------------	-----------------------------------	--	-------------------------------------	------------------------------------	-----------------	---------------------	---------------------

Course Outcomes:

The Learners will be able to

1. Demonstrate practical skills in carrying out chemical reactions of different orders to arrive at reaction kinetics.
2. Estimate quantitatively using conductometric and potentiometric titrations
3. Assess the meaning of values and calculations in experiments and learn the techniques of getting rate constants through graphical methods.
4. Understand laboratory practices and safety/First aid rules.
5. Handle electronic equipments with technical skills

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H

CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

1. Kinetics

Determination of the order of the following reactions:

- Acid catalysed hydrolysis of an ester (methyl or ethyl acetate)
- Persulphate – Potassium iodide reaction kinetics
- Iodination of acetone

2. Polarimetry

* Inversion of Sucrose

3. Molecular weight of a solute

Rast's method using naphthalene, metadinitrobenzene and diphenyl as solvents

4. Heterogeneous equilibria

- * Phenol- water system- CST

5. Effect of impurity – 2% NaCl or succinic acid solutions on CST of phenol-water system- determination of the concentration of the given solution.

6. Determination of transition temperature of the given salt hydrate

$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$, $\text{CH}_3\text{COONa} \cdot 3\text{H}_2\text{O}$, $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$, $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$

7. Electrochemistry

Conductivity

a) Conductometric titration of a strong acid against a strong base.

8. Potentiometry

- a) Titration of a strong acid against a strong base
- b) Determination of pH

9. To construct the phase diagram of a two-component system (Naphthalene-Biphenyl system) by cooling curve method.

* Not to be given for examination

Continuous Assessment – 40 marks

I C.A. - 50

II C.A. - 50

Average - 25

Performance during regular practicals-10

Regularity in submission of observation note-book and Record –5

Semester Practical examination – 60 marks

Principle writing – 5 marks

Viva-voce – 5marks

Record – 10 marks

1. Kinetics

Graph – 5 marks

Below a factor of 10 – 35 marks

By a factor of 10 – 25 marks

More than the above – 10 mark

2. Molecular weight & Effect of electrolyte

Error up to 10 % - 40 marks

10 – 20 % - 35 marks

20 – 30 % - 20 marks

Above 30% - 10 marks

3. Transition Temperature

Error up to 2°C difference – 40 marks

Error up to 7°C difference –25 marks

Error above 7°C difference – 10 marks

4. Conductivity / Potentiometric titrations /pH

Error up to 10 % - 40 marks

Error up to 15 % - 30 marks

Error up to 20 % - 20 marks

Error above 20 % - 10 marks

(Proportionate marks are reduced for in between % of error)

Reference Books:

1. Departmental Lab Manual, 2018, Reprint 2020.
2. O.P. Pandey, D.N. Bajpai & S. Giri, Practical Chemistry, S. Chand & Company Ltd.,2001.
3. B. D. Khosla, V. C. Garg & A. Gulati, Senior Practical Physical Chemistry, S. Chand & Co., New Delhi, 2011.
4. C. W. Garland, J.W. Nibler, & D.P. Shoemaker, Experiments in Physical Chemistry 8th Ed.; McGrawHill: New York, 2003.
5. P.K. Mani and A.O. Thomas, A Textbook of Practical Chemistry, Scientific Publication, 1973.

Open Educational Resources (OER):

- i. <https://www.sciencebysimulation.com/chemreax/AnalyzerAB.asp> (Kinetics)
- ii. <https://pages.uoregon.edu/tgreenbo/colligative.html> (Rast Method)

UCCHM20-PRACTICAL IV: GRAVIMETRIC ESTIMATION

Year: III SEM: VI	Course Code UCCHM20	Title of the Course Gravimetric Estimation	Course Type Practical	Course Category Core	H/W 2	Credits 4	Marks 100
--	-------------------------------	--	---------------------------------	--------------------------------	-----------------	---------------------	---------------------

Course Learning Outcomes:

The Learners will be able to

1. Quantitatively estimate metal ions using gravimetric analysis.
2. Gain knowledge on the choice of precipitating methods, reagents, crucibles and filtration.
3. Identify common errors in gravimetric analysis.
4. Outline the favourable conditions for precipitation and factors affecting the particle size of the precipitate.
5. Relate particle size of the precipitates with choice of crucibles used in gravimetric estimations.

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

1. Estimation of sulphate as barium sulphate
2. Estimation of barium as barium sulphate
3. Estimation of barium as barium chromate
4. Estimation of lead as lead chromate
5. Estimation of lead as lead sulphate
6. Estimation of nickel as DMG complex

Continuous Assessment – 40 marks

I C.A. - 50

II C.A. - 50

Average - 25

Performance during regular practicals-10

Regularity in submission of observation note-book and Record –5

Semester Practical examination – 60 marks

Viva-voce -5

Record -10

≤ 2% -45 marks

> 2 up to 3% -35 marks

> 3 up to 4% -25 marks

>4 % -15 marks

Open Educational Resources:

1. <https://www.khanacademy.org/science/chemistry/chemical-reactions-stoichiome/limiting-reagent-stoichiometry/a/gravimetric-analysis-and-precipitation-gravimetry>

UCCHN20 – PRACTICAL V: MICRO SCALE ORGANIC ANALYSIS & PREPARATION

Year:	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III SEM: VI	UCCHN20	Micro Scale Organic Analysis & Preparation	Practical	Core	2	4	100

Course Learning Outcomes:

The Learners will be able to

1. Apply the concepts of micro scale analysis in organic qualitative analysis.
2. Develop skill to analyse systematically the given organic mixture and identify the functional group and special elements.
3. Prepare simple organic compounds.
4. Discuss the importance of laboratory practices and safety/First aid rules for handling the organic chemicals.
5. Explain the significance of organic reactions to understand the theory concepts of organic chemistry.

CO	PSO
----	-----

	1	2	3	4	5	6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

CO	PO					
	1	2	3	4	5	6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

1. Organic Preparations

- Oxidation (benzaldehyde to benzoic acid)
- Hydrolysis (methyl salicylate or ethyl benzoate or benzamide to acid)
- Nitration (nitrobenzene to m-dinitrobenzene)
- Bromination (parabromoacetanilide from acetanilide)
- Benzoylation (betanaphthol to betanaphthyl benzoate)
- Acetylation (salicylic acid to aspirin)

2. Organic analysis: Reactions of the following functional groups:

Aldehyde, ketone, carboxylic acid (mono and di), ester, carbohydrate (reducing and non reducing), phenol, aromatic primary amine, amide (mono and di), nitrocompound and anilide.

Analysis of organic compounds containing one or two functional groups and characterization with a derivative.

Continuous Assessment – 40 marks

I C.A.	- 50
II C.A.	- 50
Average	- 25
Performance during regular practicals	-10
Regularity in submission of observation note-book and Record	-5

Semester Practical examination – 60 marks

Viva-voce	-5
Record	-10
Preparation	- 10 (Quantity-5, Quality-5)
Organic Analysis	- 35
Preliminary Tests	- 3
Special element	- 6
Aliphatic/Aromatic	- 4
Saturated/unsaturated	- 4
Functional group	- 8
Other tests	- 6
Derivative	- 4

References:

1. A.I. Vogel, A.R. Tatchell, B.S. Furnis, A.J. Hannaford and P.W.G. Smith, Vogel's Textbook of Practical Organic Chemistry, 5 th Edition, Pearson,2005.
2. Darshan V. Chaudhary, Organic Chemistry Practicals and Important Reagents, 1st Edition, Createspace Independent Pub, 2016.

Open Educational Resources (OER):

1. <https://www.toppr.com/guides/chemistry/organic-chemistry/qualitative-analysis-of-organic-compounds/>
2. <https://vlab.amrita.edu/?sub=2&brch=191&sim=345&cnt=1>