

# T.Y.B.Sc. CHEMISTRY (3 UNITS)

Choice Based Credit System

## SEMESTER V

### ANALYTICAL CHEMISTRY

COURSE CODE: USCH504

CREDITS: 01

LECTURES: 30

<b>UNIT I :INTRODUCTION TO QUALITY CONCEPTS,CHEMICAL CALCULATIONS AND SAMPLING (3 &amp; 6 UNITS)</b>			
<b>1.1</b>	<b>Quality in Analytical Chemistry</b>		<b>05 L</b>
	1.1.1	Concepts of Quality, Quality Control and Quality Assurance	
	1.1.2	Importance of Quality concepts in Industry	
	1.1.3	Chemical Standards and Certified Reference Materials; Importance in chemical analysis Quality of material: Various grades of laboratory reagents	
<b>1.2</b>	<b>Chemical Calculations (Numericals and word problems are expected)</b>		<b>04 L</b>
	1.2.1	Inter conversion of various concentration units. (Conversion of concentration from one unit to another unit with examples)	
	1.2.2	Percent composition of elements in chemical compounds	
<b>1.3</b>	<b>Sampling</b>		<b>06 L</b>
	1.3.1	Purpose, significance and difficulties encountered in sampling	
	1.3.2	Sampling of solids: Sample size – bulk ratio, size to weight ratio, multistage and sequential sampling, size reduction methods, sampling of compact solids, equipments and methods of sampling of compact solids, sampling of particulate solids, methods and	

		equipments used for sampling of particulate solids.	
	1.3.3	Sampling of liquids: Homogeneous and heterogeneous, Static and flowing liquids.	
	1.3.4	Sampling of gases: Ambient and stack sampling: Apparatus and methods for sampling of gases.	
	1.3.5	Collection, preservation and dissolution of the sample.	
<b>UNIT II : CLASSICAL METHODS OF ANALYSIS (TITRIMETRY)</b>			
<b>2.1</b>	<b>Redox Titrations (Numerical and word Problems are expected)</b>		<b>08 L</b>
	2.1.1	Introduction	
	2.1.2	Construction of the titration curves and calculation of $E_{\text{system}}$ in aqueous medium in case of: (1) One electron system (2) Multielectron system	
	2.1.3	Theory of redox indicators, Criteria for selection of an indicator Use of diphenyl amine and ferroin as redox indicators	
<b>2.2</b>	<b>Complexometric Titrations</b>		<b>07 L</b>
	2.2.1	Introduction, construction of titration curve	
	2.2.2	Use of EDTA as titrant and its standardisation, absolute and conditional formation constants of metal EDTA complexes, Selectivity of EDTA as a titrant. Factors enhancing selectivity with examples. Advantages and limitations of EDTA as a titrant.	
	2.2.3	Types of EDTA titrations.	
	2.2.4	Metallochromic indicators, theory, examples and applications	

## REFERENCES

1.	3000 solved problems in Chemistry, David E. Goldberg,PhD.,Schaums Outline	Unit/s: (1.2)
2.	A guide to Quality in Analytical Chemistry: An aid to accreditation, CITAC and EURACHEM, (2002),	Unit/s (1.1)
3.	A premier sampling solids, liquids and gases, Smith Patricia I, American statistical association and the society for industrial and applied mathematics, (2001)	Unit/s (1.3)
4.	Analytical Chemistry Skoog, West ,Holler,7th Edition:	Unit/s (2.1)
5.	Handbook of quality assurance for the analytical chemistry laboratory, 2ndEdn., James P. DuxVanNostr and Reinhold, 1990	Unit/s (1.1)
6.	Quality control and Quality assurance in Analytical Chemical Laboratory, Piotr Konieczka and Jacek Namiesnik, CRC press (2018)	Unit/s (1.1)
7.	Quality in the Analytical Chemistry Laboratory, Elizabeth Prichard, Neil T. Crosby, Florence Elizabeth Prichard, John Wiley and Sons, 1995	Unit/s (1.1)

## PRACTICALS

### SEMESTER V

### ANALYTICAL CHEMISTRY

**COURSE CODE: USCHP15**

**CREDITS: 01**

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| <ol style="list-style-type: none"><li>1. Estimation of magnesium content in Talcum powder by complexometry, using standardized solution of EDTA</li><li>2. Determination of COD of water sample.</li><li>3. To determine potassium content of a Fertilizer by Flame Photometry (Calibration curve method).</li></ol> |
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**Note: Calculation of percent error is expected for all the**

**experiments.**

## REFERENCES

1.	Vogel's Textbook of Quantitative Chemical Analysis, 5thEdn., G. H. Jeffery, J Bassett, J Memdham and R C Denney, ELBS with Longmann (1989).
2.	Vogel's Textbook of Quantitative Chemical analysis, Sixth edition, J.Mendham et.al

<b>SEMESTER VI</b>		
<b>ANALYTICAL CHEMISTRY</b>		
<b>COURSE CODE: USCH604</b>	<b>CREDITS: 01</b>	<b>LECTURES: 30</b>
<b>UNIT I: ELECTRO ANALYTICAL TECHNIQUES</b>		
<b>1.1</b>	<b>Polarography (Numerical and word problems are expected)</b>	<b>11L</b>
1.1.1	Difference between potentiometry and voltammetry, Polarizable and non-polarizable electrodes	
1.1.2	Basic principle of polarography H shaped polarographic cell, DME (construction, working, advantages and limitations)	
1.1.3	DC polarogram: Terms involved - Residual current, Diffusion current, Limiting current, Half-Wave Potential Role and selection of supporting electrolyte, Interference of oxygen and its removal, polarographic Maxima and Maxima Suppressors Qualitative aspects of Polarography: Half wave potential $E_{1/2}$ , Factors affecting $E_{1/2}$ Quantitative aspects of polarography: Ilkovic equations: various terms involved in it (No derivation)	
1.1.4	Quantification 1) Wave height – Concentration plots (working plots/calibration) 2) Internal standard (pilot ion) method 3) Standard addition method	
1.1.5	Applications advantages and limitations	
<b>1.2</b>	<b>Amperometric Titrations</b>	<b>04L</b>

	1.2.1	Principle, Rotating Platinum Electrode(Construction, advantages and limitations)	
	1.2.2	Titration curves with example	
	1.2.3	Advantages and limitations	
<b>UNIT II: METHODS OF SEPARATION - II (3 &amp; 6 UNITS)</b>			
<b>2.1</b>	<b>Gas Chromatography (Numerical and word problems are expected)</b>		<b>09 L</b>
	2.1.1	Introduction, Principle, Theory and terms involved	
	2.1.2	Instrumentation: Block diagram and components,types of columns, stationary phases in GSC and GLC, Detectors: TCD, FID, ECD	
	2.1.3	Qualitative, Quantitative analysis and applications	
	2.1.4	Comparison between GSC and GLC	
<b>2.2</b>	<b>Ion Exchange Chromatography</b>		<b>06 L</b>
	2.2.1	Introduction, Principle.	
	2.2.2	Types of Ion Exchangers , Ideal properties of resin	
	2.2.3	Ion Exchange equilibria and mechanism, selectivity coefficient and separation factor Factors affecting separation of ions	
	2.2.4	Ion exchange capacity and its determination for cation and anion exchangers.	
	2.2.5	Applications of Ion Exchange Chromatography with reference to Preparation of demineralised water, Separation of amino acids	

### REFERENCES

1.	Analytical Chemistry, Gary.D Christan, 5th edition	Unit/s (2.1,2.2)
2.	Analytical chemistry, R. K. Dave.	Unit/s (2.1,2.2)

3.	Chemical methods of separation, J A Dean, Van Nostrand Reinhold, 1969	Unit/s (2.1,2.2)
4.	Egyankosh.ac.in/bitstream/123456789/43329/1/Unit-8	Unit/s (1.1,1.2,1.3)
5.	Fundamentals of Analytical Chemistry, D .A. Skoog and D. M. West and F. J. Holler Holt., Saunders 6th Edition (1992)	Unit/s (2.1,2.2)
6.	Instrumental methods Of Analysis, by Willard Merritt Dean, 7thEdition, CBS Publisher and distribution Pvt Ltd	Unit/s (1.1,1.2,1.3)
7.	Introduction to Polarography and Allied Techniques, By Kamala Zutshi, New Age International, 2006.	Unit/s (1.1,1.2,1.3)
8.	Principles of Polarography by Jaroslav Heyrovský , Jaroslav Kůta, 1st Edition, Academic Press, eBook ISBN: 978148326478	Unit/s (1.1,1.2,1.3)
9.	Solvent extraction and ion exchange, J Marcus and A. S. Kertes Wiley INC 1969	Unit/s (2.1,2.2,)

**PRACTICALS**  
**SEMESTER VI**  
**ANALYTICAL CHEMISTRY**

**COURSE CODE: USCHP16**

**CREDITS: 01**

- 1 Estimation of Chromium in water sample spectrophotometrically by using Diphenyl carbazide.
- 2 Estimation of  $Mg^{+2}$  &  $Zn^{+2}$  by anion exchange resin.
3. Estimation of acetic acid in Vinegar sample by using Quinhydrone electrode potentiometrically.

**Note: Calculation of percent error is expected for all the experiments.**

## **REFERENCES**

1.	Vogel's Textbook of Quantitative Chemical Analysis, 5thEdn., G. H. Jeffery, J Bassett, J Memdham and R C Denney, ELBS with Longmann (1989).
2.	Vogel's Textbook of Quantitative Chemical analysis, Sixth edition, J.Mendham et.al
3.	The chemical analysis of food and food products III edition Morris Jacob
4.	The chemical analysis of food by David Pearson and Henry Edward