





C. U. SHAH UNIVERSITY
WADHWAN CITY
FACULTY OF SCIENCES

B.Sc.

SEM - II

Syllabi (CBCS)
WEF
June 2016



## **FACULTY OF SCIENCES**

## **DEPARTMENT OF CHEMISTRY**

COURSE: B.Sc. SEMESTER: II SUBJECT NAME: Chemistry-II SUBJECT CODE: 4SC02CHE1

**Teaching & Evaluation Scheme:-**

Teaching hours/week				Credit	Evaluation Scheme/semester							
						Theory			Practical			
Th	Tu	Pr	Total		Sessional University Exam Exam		Internal University		Total Marks			
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3				100

## **Objectives: -**

- The course will help the student to understand organic properties of alcohol, ether, phenol and their structure.
- To understand types of ionic bonding, electromotive force and MOT.
- To understand basic principles of analytical chemistry characteristic and use of electromotive force, catalysis.
- To understand water analysis and catalyst application.

### **Prerequisites:-**

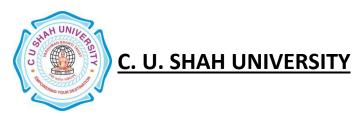
• Students should have basic knowledge of chemistry up to 10+2 level.

#### Course outline:-

Sr.	Course Contents							
No.								
1	Organic Chemistry:							
	Alcohols, Phenols and Ethers							
	<ul> <li>IUPAC Nomenclature of alcohols (mono, di and trihydric alcohols), phenols and ethers</li> </ul>							
	<ul> <li>Physical properties of alcohols</li> </ul>							
	<ul> <li>Chemical properties of alcohols [Reactions of O-H bond cleavage and C-</li> </ul>							
	O bond cleavage - only reactions]							



	<ul> <li>Industrial production of phenol</li> <li>Dow Process</li> <li>Cumene Process</li> <li>Physical properties of phenol</li> <li>Chemical properties of phenol</li> <li>Reactions of O-H group</li> <li>Reactions of aromatic ring [Electrophilic substitution reactions, Reimer Tiemann Reaction, Kolbe Schmitt Reaction, Fries Rearrangement – with reaction mechanism]</li> <li>Relative acidity of alcohols and phenols</li> <li>Preparation of ethers – Williamson Synthesis</li> <li>Physical properties of ethers</li> <li>Chemical properties of ethers</li> <li>Substitution reaction [Reaction with Cl<sub>2</sub> in dark &amp; Reaction of Cl<sub>2</sub> in light]</li> <li>Reactions involving C-O bond cleavage [hydrolysis, reaction with H<sub>2</sub>SO<sub>4</sub>, cold HI and hot HI]</li> </ul>	
2	<ul> <li>Amines</li> <li>Classification and Nomenclature</li> <li>Basicity of amines</li> <li>Physical properties of amines</li> <li>Preparation of primary amines [Reduction of nitro compounds, reaction of organic halides with ammonia, Hoffmann degradation of amides]</li> <li>Chemical properties of primary amines [Reaction with acid chlorides, aryl sulphonyl chlorides, reaction with alkyl halides]</li> <li>Chemical properties of Aniline [Reactions of Aniline with acid chlorides, aryl sulphonyl chlorides, Reaction with bromine (formation of 2,4,6 -tri bromo aniline and p- bromo aniline)</li> <li>Diazotization of Aniline and reactions of Diazonium salt</li> <li>Hinesburg Reaction to distinguish between primary, secondary and tertiary amines</li> </ul>	10
3	Inorganic Chemistry: Ionic Solids Introduction Characteristics of ionic solids Born-Haber Cycle Max Born Equation Limiting radius ratio Relation between radius ratio, coordination number and crystal structure Derivation of r+/r- ratio in trigonal, square planar, body centered and tetrahedral crystal lattice	08



Crystal structure of ionic solids: HCP, BCP and FCC Crystal structure of ionic solids: 1. AB type - CsCl and ZnS (zinc blende) 2. AB₂ type - CaF₂ and TiO₂ Defects in lonic Crystal Lattice (stolchiometric and non-stochiometric) Semi-conductors  Molecular Orbital Theory Basic Concepts of Molecular Orbital Theory Characteristics of molecular orbitals with necessary diagram (i.e. bonding, anti-bonding, gerade and ungerade orbitals) Energy level diagram of diatomic molecules of First and Second row elements of periodic table and NO & CO molecules Electronic configuration of the above mentioned molecules and calculation of bond order and magnetic moment Comparison of MO and VB Theories  Physical Chemistry: Electromotive Force Introduction, Types of Cell Half-cell, Reversible and irreversible cell Convention sign, Types of Electrodes Standard Electrode Potential, Electrolytic Cell Galvanic Cell EMF series, Representation of Cell Relation between G, H and K Nernst Equation and its applications  Catalysis Introduction Types of catalyst Functions Theories Acid base catalyst Enzyme catalyst Enzyme catalyst Enzyme catalyst Functions Interduction Factors affecting qualitative analysis: common ion effect, solubility product (k <sub>Sp</sub> ) Use of NHaCl and H <sub>2</sub> S in Qualitative analysis Use of HCl and H <sub>2</sub> S in Qualitative analysis Numerical on common ion effect and k <sub>sp</sub>			
1. AB type - CsCl and ZnS (zinc blende) 2. ABz type - CaF2 and TiO2 9. Defects in lonic Crystal Lattice (stoichiometric and non-stochiometric) • Semi-conductors  4. Molecular Orbital Theory • Basic Concepts of Molecular Orbital Theory • Characteristics of molecular orbitals with necessary diagram (i.e. bonding, anti-bonding, gerade and ungerade orbitals) • Energy level diagram of diatomic molecules of First and Second row elements of periodic table and NO & CO molecules • Electronic configuration of the above mentioned molecules and calculation of bond order and magnetic moment • Comparison of MO and VB Theories  5. Physical Chemistry: Electromotive Force • Introduction, Types of Cell • Half-cell, Reversible and irreversible cell • Convention sign, Types of Electrodes • Standard Electrode Potential, Electrolytic Cell • EMF series, Representation of Cell • Relation between G, H and K • Nernst Equation and its applications  6. Catalysis • Introduction • Types of catalyst • Functions • Theories • Acid base catalyst • Enzyme catalyst • Enzyme catalyst • Enzyme catalyst • Enzyme catalyst • Applications  7. Analytical Chemistry:  Basic Principles of Qualitative Analysis • Introduction • Factors affecting qualitative analysis: common ion effect, solubility product (kso) • Use of NHaCl and NHaOH in Qualitative analysis • Use of HCl and H <sub>2</sub> S in Qualitative analysis		<ul><li>Crystal structure of ionic solids: HCP, BCP and FCC</li></ul>	
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<ul> <li>Factors affecting qualitative analysis: common ion effect, solubility product (k<sub>sp</sub>)</li> <li>Use of NH<sub>4</sub>Cl and NH<sub>4</sub>OH in Qualitative analysis</li> <li>Use of HCl and H<sub>2</sub>S in Qualitative analysis</li> </ul>		•	
product (k <sub>sp</sub> )  ■ Use of NH <sub>4</sub> Cl and NH <sub>4</sub> OH in Qualitative analysis  ■ Use of HCl and H <sub>2</sub> S in Qualitative analysis			
<ul> <li>Use of NH₄Cl and NH₄OH in Qualitative analysis</li> <li>Use of HCl and H₂S in Qualitative analysis</li> </ul>			
■ Use of HCl and H <sub>2</sub> S in Qualitative analysis			
·		·	
<ul> <li>Numerical on common ion effect and k<sub>sp</sub></li> </ul>		·	
		<ul> <li>Numerical on common ion effect and k<sub>sp</sub></li> </ul>	



	Necessary explanation with chemical equations in	
	1. Charcoal test	
	2. Cobalt nitrate test	
	3. Borax bead test	
	4. Flame test	
8	Water Analysis	05
	<ul> <li>Analysis of hardness of water in terms of</li> </ul>	
	Total solid and volatile solid	
	Non-filterable solid and non-filterable volatile solid	
	Filterable solid	
	Total solid	
	Total Suspended Solid	
	<ul> <li>Acidity</li> </ul>	
	Basicity or Alkalinity	
	Turbidity	
	<ul> <li>Various methods for determination of hardness of water</li> </ul>	

#### **Learning Outcomes:-**

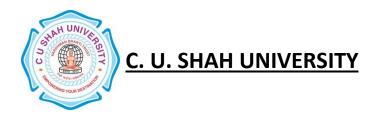
The students are expected to

- Understand basic atomic and molecular structure and factors that determine stability of inorganic compounds.
- Various methods of determination of hardness of water.
- Role of catalyst in chemistry.

#### **Books Recommended:-**

#### **Organic Chemistry**

- 1. 'Advanced Organic Chemistry', ArunBahl and B.S.Bahl.
- 2. 'Text Book of Organic Chemistry for BSc students', B.S. Bahl.
- 3. 'A Textbook of Organic Chemistry', K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra.
- 4. 'Organic Chemistry (Volume I, II & III)', S.M. Mukherji, S.P. Singh and R.P. Kapoor.
- 5. 'Organic Chemistry', Morrison and Boyd.
- 6. 'Organic Chemistry', T.W. Graham Solomons and Craig B. Fryhle.
- 7. 'Organic Chemistry', Francis A. Carey.
- 8. 'Organic Chemistry', Clayden.
- 9. 'Fundamentals of Organic Chemistry', **Solomon**, John Wiley.
- 10. 'Textbook of Organic Chemistry', P.L. Soni and H.M. Chawla.



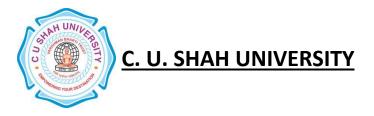
- 11. 'March's Advanced Organic Chemistry Reactions, Mechanism and Structure', Michael B. Smith and Jerry March.
- 12. 'Reaction Mechanisms and Reagents in Organic Chemistry', Gurudeep R. Chatwal.
- 13. 'Advanced Organic Reaction Mechanism', N. Tewari.
- 14. 'Organic Chemistry', I.L. Finar.

#### **Inorganic Chemistry**

- 1. 'Concise Inorganic Chemistry', J. D. Lee, ELBS.
- 2. 'Basic Inorganic Chemistry', FA. Cotton and G. Wilkinson.
- 3. 'Advanced Inorganic Chemistry (3rd Edition)', FA. Cotton and G. Wilkinson, Wiley Eastern Pvt. Ltd.
- 4. 'Valence and Molecular Structure', Cartmell and Fowels.
- 5. 'Atomic Structure and Chemical Bonding', Manas Chanda.
- 6. 'Inorganic Chemistry', Suretker Thate.
- 7. 'Inorganic Chemistry', James E. Huheey (3rd Edition), Harper International SI Edition.
- 8. 'Coordination Chemistry', **GurdeepChatwal and M.S.Yadav**, *Himalaya Publishing House*.
- 9. 'Principles of Inorganic Chemistry', **B.R. Puri, L.R. Sharma & K.C.Kalia**, *Vallabh Publications, Delhi*.
- 10. 'Modern Aspects of Inorganic Chemistry', **H.J. Emeleus and A.G. Sharpe**, *Routledge* & *Kegan Paul Ltd.*, 39 Store street, London WCIE7DD.
- 11. 'Magneto Chemistry', Shyamal & Datta.

## **Physical Chemistry**

- 1. 'A Textbook of Physical Chemistry', P. L. Soni, O.P. Dharmarha and U.N. Dash.
- 2. 'Physical Chemistry', Dr. D. R. Pandit, A. R. Rao and Padke.
- 3. 'Progressive Physical Chemistry', **Dr. Snehi**, *Merrut Publications*.
- 4. 'Principles of Physical Chemistry', Puri, Sharma, Pathania.
- 5. 'A text book of Physical Chemistry', Samuel Glasstone.
- 6. 'Elements of Physical Chemistry', Samuel Glasstone and D lewis.
- 7. 'Thermodynamics for Chemists', Samuel Glasstone.
- 8. 'Introduction to Electrochemistry', S. Gladstone.
- 9. 'A text book of Physical Chemistry', **B.K. Sharma.**
- 10. 'Emf', B.K. Sharma.
- 11. 'Principles of Physical Chemistry', S.H. Maron and C.F. Prutton.
- 12. 'Elements of Physical Chemistry', B.R.Puri, L.R. Sharma, M.S.Pathania.
- 13. 'Advanced Physical Chemistry', J.N.Gurtu.
- 14. 'Physical Chemistry', N. Kundu and S.K. Jain.
- 15. 'Physical Chemistry', K. L. Kapoor.



- 16. 'Thermodynamics', Gurudeeep Raj.
- 17. 'Comprehensive Physical Chemistry', HemandSnehi.
- 18. 'Introduction to Physical Chemistry', Madan and Madan.

#### **Analytical Chemistry**

- 1. 'Fundamental of analytical chemistry', Skoog& West.
- 2. 'Instrumental Method & Chemical Analysis', B.K. Sharma.
- 3. 'Water Analysis and Water pollution', V.P. Kudesia.
- 4. 'Instrumental Method & Chemical Analysis', Chatwal Anand.
- 5. 'Book for Water Analysis', R. K. Trivedi, V. P. Kudesia.
- 'Analytical Chemistry', Dick.
- 7. 'Inorganic Qualitative Analysis', Vogel and Gehani Parekh.
- 8. 'Electrometric Methods of Analysis', Browning.
- 9. 'Principle of Instrumental Analysis', Skoog.

#### E-Resources:-

- 1. <a href="http://www.chemguide.co.uk/atoms/properties/gcse.html">http://www.chemguide.co.uk/atoms/properties/gcse.html</a>
- 2. <a href="http://en.wikipedia.org/wiki/Chemical bond">http://en.wikipedia.org/wiki/Chemical bond</a>
- 3. <a href="http://www.sparknotes.com/chemistry/bonding/properties/section1.rhtml">http://www.sparknotes.com/chemistry/bonding/properties/section1.rhtml</a>
- 4. <a href="http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/bond2.html">http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/bond2.html</a>
- 5. http://www.chem1.com/acad/webtext/chembond/cb01.html
- 6. http://en.wikipedia.org/wiki/Nuclear chemistry
- 7. http://www.chem.duke.edu/~jds/cruise chem/nuclear/nuclear.html
- 8. http://library.thinkquest.org/10429/low/nuclear/nuclear.htm
- 9. http://www.visionlearning.com/library/module\_viewer.php?mid=59
- 10. http://en.wikipedia.org/wiki/Chemical thermodynamics
- 11. http://www.shodor.org/unchem/advanced/thermo/
- 12. http://www.chem.arizona.edu/~salzmanr/480a/480ants/chemther.html
- 13. http://en.wikipedia.org/wiki/Laws of thermodynamics



# **FACULTY OF SCIENCES**

# **DEPARTMENT OF CHEMISTRY**

COURSE: B.Sc. SEMESTER: II SUBJECT NAME: Chemistry Practical-II SUBJECT CODE: 4SC02PRC1

**Teaching & Evaluation Scheme:-**

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory		Practical					
Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	Total Marks
					Marks	Hrs	Marks	Hrs	Pr	TW		
0	0	6	6	3					10	10	30	50

#### Course outline:-

Sr.	Course Contents
No.	
1	Qualitative Analysis of Inorganic Salts (2 radicals)
	Inorganic salts containing chlorides, bromides, iodides, nitrates, sulphates, sulphites, sulphides, carbonates, chromates, and dichromates as an anion.
2	Inorganic Volumetric Analysis: (Standard Solutions should be given)
	<ul> <li>Estimation of the amount of Cu<sup>2+</sup> in the given CuCl<sub>2</sub>.2H<sub>2</sub>O solution using 0.01 M EDTA solution.</li> </ul>
	<ul> <li>Estimation of the amount of Ni<sup>2+</sup> in the given NiSO<sub>4</sub>.7H<sub>2</sub>O solution using 0.01 M EDTA solution.</li> </ul>
	■ Estimation of the amount of Zn <sup>2+</sup> in the given ZnCl <sub>2</sub> solution using 0.01 M EDTA solution.
	<ul><li>Estimation of total, temporary &amp; permanent hardness of water.</li></ul>
	<ul> <li>Determination of acetic acid in commercial vinegar using 0.1 M NaOH.</li> </ul>
3	Demonstrative practical:
	<ul> <li>Calibration of Glassware (Measuring Cylinder &amp; flasks).</li> </ul>
	■ Crystallization of Inorganic compounds.
	<ul><li>Preparation of standard solutions (Primary &amp; Secondary).</li></ul>