



C. U. SHAH UNIVERSITY



**C. U. SHAH UNIVERSITY
WADHWAN CITY
FACULTY OF SCIENCES**

B.Sc.

SEM-I

**Syllabi (CBCS)
WEF June 2016**



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: I

SUBJECT NAME: Chemistry-I

SUBJECT CODE: 4SC01CHE1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					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 internal (atomic and molecular) structure of compound.
- To understand the properties of different types of chemical bonding and in addition to that what are the factors which affect nature of bonding.
- Principles of thermodynamics and application.

Prerequisites:-

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

Course outline:-

Sr. No.	Course Contents	Hours
1	Organic Chemistry: Substitution and Elimination Reactions of Alkyl halides <ul style="list-style-type: none">▪ Definition of Substitution and Elimination reactions▪ Types of Reactions▪ SN¹ & SN² Reaction Mechanism with energy diagram▪ Substitution Reactions of alkylhalide: Reaction with aqueous KOH or moist Ag₂O, Alkoxides or dry Ag₂O, NaSH or KSH, Na₂S or K₂S, Alcoholic KCN, AgCN, Alcoholic NH₃, KNO₂ or AgNO₂▪ E1 & E2 Reaction Mechanism	10



	<ul style="list-style-type: none">▪ Comparison of Substitution Nucleophilic & Elimination mechanisms.	
2	<p>Cycloalkanes</p> <ul style="list-style-type: none">▪ IUPAC Nomenclature of Cycloalkanes: monocyclic, bicyclic and tricyclic systems▪ Method of Preparation of small ring Cycloalkanes by Fund's Method, Perkin Method, Sabatier and Sanderson's Method, Dieckmann's Method▪ Physical Properties of Cycloalkanes▪ Chemical Properties of Cycloalkanes<ol style="list-style-type: none">1. Substitution Reactions2. Addition Reactions▪ Baeyer's Strain Theory▪ Sacshe-Mohr concept of Strainless rings▪ Preparation of Large ring cycloalkanes<ol style="list-style-type: none">1. Thorpe- Ziegler's method2. Acyloin Condensation	10
3	<p>Inorganic Chemistry:</p> <p>Periodic Properties</p> <ul style="list-style-type: none">▪ Mendeleev's Periodic Law & Modern Periodic Law▪ Definitions of Family or Group and Period▪ Explanation and General Trends of the following Periodic Properties Atomic and Ionic Radii, Ionization Potential or Energy, Electron affinity and electronegativity▪ Pauli's method for the determination of ionic radius of isoelectronic ions and problems based on it	05
4	<p>Bonding and Shapes of Molecules</p> <ul style="list-style-type: none">▪ Valence Bond Theory and its limitations▪ Hybridization – Concept of hybridization sp {C_2H_2, $BeCl_2$}, sp^2 {BF_3, C_2H_4}, sp^3 {CH_4}, sp^3d {PCl_5}, sp^3d^2 {SF_6}▪ Stereochemistry of inorganic molecules<ol style="list-style-type: none">1. Sidgwick Powell Rule2. VSEPR Theory	05
5	<p>Physical Chemistry:</p> <p>Thermodynamics</p> <ul style="list-style-type: none">▪ Definition of thermodynamics term: system, surroundings▪ Types of systems▪ Intensive and extensive properties▪ State and path functions and their differential▪ Thermodynamic processes▪ Concept of heat and work▪ First Law of Thermodynamics: Statement & Mathematical form▪ Definition of internal energy and enthalpy	10



	<ul style="list-style-type: none"> ▪ Calculation of w, q, ΔE & ΔH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process ▪ Bond dissociation energy and its calculation from thermochemical data ▪ Work obtained during adiabatic and isothermal change ▪ Heat capacity: heat capacities at constant volume and pressure and their relationship $C_p - C_v = R$ ▪ Zeroth Law: mathematical treatment of zeroth law and its limitation and various statements of law ▪ Joule's law-Joule Thomson coefficient and inversion temperature (only definition) 	
6	<p>Adsorption</p> <ul style="list-style-type: none"> ▪ Introduction ▪ Types of adsorption ▪ Uses of adsorption ▪ Langmuir adsorption isotherms at high & low pressure and its limitations ▪ Freundlich adsorption isotherms and its limitations 	05
7	<p>Analytical Chemistry: Modes of Concentration [Concentration Concept with Numerical]</p> <ul style="list-style-type: none"> ▪ Preparation of Standard Solutions <ol style="list-style-type: none"> 1. Equivalent weight of acid and base 2. Equivalent weight of acid salt 3. Equivalent weight of an ion ▪ Molarity with numerical ▪ Normality with numerical ▪ Molality with numerical ▪ Strength of solutions ▪ % Concentration w/v ▪ Weight Fraction ▪ Volume Fraction 	08
8	<p>Acids and Bases</p> <ul style="list-style-type: none"> ▪ Degree of hydrolysis (h) ▪ Derivation of hydrolysis constant (k_h) ▪ pH of salt of <ol style="list-style-type: none"> 1. Strong acid-weak base 2. Strong base- weak acid 3. Weak acid-weak base ▪ Buffers solution- buffer capacity ▪ Mechanism of acidic and basic buffer solution ▪ Numerical – calculation of pH of buffer solutions ▪ Derivation of equation for pH of acidic and basic buffer solution 	07



Learning Outcomes:-

The students are able to:

- Analyze the acids and bases.
- Learn the basics of organic reaction and bonding and shapes of molecules.
- Apply thermodynamics to different types of chemical reactions.

Books Recommended:-

Organic Chemistry

1. 'A Textbook of Organic Chemistry', **K.S. Tewari, N.K.Vishnoi and S.N. Mehrotra.**
2. 'Organic Chemistry' **Morrison and Boyd.**
3. 'Organic Chemistry (Volume I, II & III)', **S.M. Mukherji, S.P. Singh and R.P. Kapoor.**
4. 'Advanced Organic Chemistry', **ArunBahl and B.S.Bahl.**
5. 'Text Book of Organic Chemistry for BSc students', **B.S. Bahl.**
6. 'Organic Chemistry', **T.W. Graham Solomons and Craig B. Fryhle.**
7. 'Organic Chemistry', **I.L.Finar.**
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.**

Inorganic Chemistry

1. 'Inorganic Chemistry', **James E. Huheey** (3rd Edition), **Harper International SI Edition.**
2. 'Concise Inorganic Chemistry', **J. D. Lee, ELBS.**
3. 'Magneto Chemistry', **Shyamal&Datta.**
4. 'Advanced Inorganic Chemistry (3rd Edition)', **FA. Cotton and G. Wilkinson, Wiley Eastern Pvt. Ltd.**
5. 'Valence and Molecular Structure', **Cartmell and Fowels.**
6. 'Atomic Structure and Chemical Bonding', **ManasChanda.**
7. 'Inorganic Chemistry', **SuretkerThate.**
8. 'Coordination Chemistry', **GurdeepChatwal and M.S Yadav, Himalaya Publishing House.**
9. 'Basic Inorganic Chemistry', **FA. Cotton and G. Wilkinson.**
10. 'Principles of Inorganic Chemistry', **B.R. Puri, L.R. Sharma & K.C Kalia, Vallabh Publications, Delhi.**



11. 'Modern Aspects of Inorganic Chemistry', **H.J. Emeleus and A.G. Sharpe**, *Routledge & Kegan Paul Ltd., 39 Store street, London WC1E7DD.*

Physical Chemistry

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

Analytical Chemistry

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

E-Resources:-

1. <http://library.thinkquest.org/10429/low/atomic/atomic.html>
2. <http://en.wikipedia.org/wiki/Atom>



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3. <http://www.chemguide.co.uk/atoms/properties/gcse.html>
4. http://en.wikipedia.org/wiki/Chemical_bond
5. <http://www.sparknotes.com/chemistry/bonding/properties/section1.rhtml>
6. <http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/bond2.html>
7. <http://www.chem1.com/acad/webtext/chembond/cb01.html>
8. http://en.wikipedia.org/wiki/Nuclear_chemistry
9. http://www.chem.duke.edu/~jds/cruise_chem/nuclear/nuclear.html
10. <http://library.thinkquest.org/10429/low/nuclear/nuclear.htm>
11. http://www.visionlearning.com/library/module_viewer.php?mid=59
12. http://en.wikipedia.org/wiki/Chemical_thermodynamics
13. <http://www.shodor.org/unchem/advanced/thermo/>
14. <http://www.chem.arizona.edu/~salzmanr/480a/480ants/chemther.html>
15. http://en.wikipedia.org/wiki/Laws_of_thermodynamics



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0	0	6	6	3	--	--	--	--	10	10	30	50	

Course outline:-

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1	Organic Qualitative Analysis [Mono functional Compounds] Compounds containing one functional group such as phenolic, carboxylic acid, ester, amide, nitro, amine, aldehyde, ketone, alcohol, halogen, anilides, carbohydrate and hydrocarbon.
2	Volumetric Analysis <ol style="list-style-type: none">To prepare solution of acids and bases with definite concentrationTo prepare a solution by dissolving 'x' g NaHCO_3 / Na_2CO_3 in 100 ml solution and determine its concentration in terms of normality and molarity using the given 0.1 M HCl solutionTo determine the normality, molarity and g/litre of NaOH and HCl using 0.05M Na_2CO_3 solutionTo determine the molarity, g/litre and normality of each component in a given mixture of NaHCO₃ and Na₂CO₃ the using 0.1 M HCl solutionTo determine the molarity, g/litre and normality of each component in a mixture of H₂C₂O₄.2H₂O and H₂SO₄ using 0.02 M KMnO_4 and 0.1 M NaOH solutionTo determine the molarity, g/litre and normality of each component in a mixture of H₂C₂O₄.2H₂O and K₂C₂O₄.H₂O using 0.1 M NaOH and 0.02 M KMnO_4 solution



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	7. To determine the molarity, g/litre and normality of KMnO_4 and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ solution using 0.05 M $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ solution
3	Demonstrative practical's: <ul style="list-style-type: none">• Calibration of Glassware (Burette & Pipette)• Crystallization of Organic compounds