



**C. U. SHAH UNIVERSITY**



**B.Sc.**

**SEM-I & II**

**Syllabi (CBCS) of  
Chemistry**

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



# C. U. SHAH UNIVERSITY

## FACULTY OF SCIENCE

### DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: I

SUBJECT NAME: Chemistry-I

SUBJECT CODE: BSCCHC101

#### Teaching & Evaluation Scheme:-

Teaching Scheme(hrs)			Evaluation Scheme									
Th	Pr	Total	Theory					Practical (Marks)			Total	
			Sessional Exam		University Exam		Total	External	Internal	Total		
			Marks	Hrs	Marks	Hrs						
4	0	4	30	1.5	70	3	100	--	--	--	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.
- To understand basic characteristic and use of.
- 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	<b>Organic Chemistry:</b> <b>Substitution and Elimination Reactions of Alkylhalides</b> <ul style="list-style-type: none"><li>▪ Definition of Substitution and Elimination reactions</li><li>▪ Types of Reactions</li><li>▪ SN<sup>1</sup>&amp; SN<sup>2</sup> Reaction Mechanism with energy diagram</li><li>▪ Substitution Reactions of alkylhalide: Reaction with Aqueous KOH or moist Ag<sub>2</sub>O, Alkoxides or dry Ag<sub>2</sub>O, NaSH or KSH, Na<sub>2</sub>S or K<sub>2</sub>S, Alcoholic KCN, AgCN, Alcoholic NH<sub>3</sub>, KNO<sub>2</sub> or AgNO<sub>2</sub></li></ul>	10



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	<ul style="list-style-type: none"><li>▪ E1 &amp; E2 Reaction Mechanism</li><li>▪ Comparison of Substitution Nucleophilic &amp; Elimination mechanisms.</li></ul>	
2	<p><b>Cycloalkanes</b></p> <ul style="list-style-type: none"><li>▪ IUPAC Nomenclature of Cycloalkanes: monocyclic, bicyclic and tricyclic systems</li><li>▪ Method of Preparation of small ring Cycloalkanes by<ol style="list-style-type: none"><li>1. Fund's Method</li><li>2. Perkin Method</li><li>3. Sabatier and Sanderson's Method</li><li>4. Dieckmann's Method</li></ol></li><li>▪ Physical Properties of Cycloalkanes</li><li>▪ Chemical Properties of Cycloalkanes<ol style="list-style-type: none"><li>1. Substitution Reactions</li><li>2. Addition Reactions</li></ol></li><li>▪ Baeyer's Strain Theory</li><li>▪ Sacche-Mohr concept of Strainless rings</li><li>▪ Preparation of Large ring cycloalkanes<ol style="list-style-type: none"><li>1. Thorpe- Ziegler's method</li><li>2. Acyloin Condensation</li></ol></li></ul>	10
3	<p><b>Inorganic Chemistry:</b></p> <p><b>Periodic Properties</b></p> <ul style="list-style-type: none"><li>▪ Mendeleev's Periodic Law &amp; Modern Periodic Law</li><li>▪ Definitions of Family or Group and Period</li><li>▪ Explanation and General Trends of the following Periodic Properties<ol style="list-style-type: none"><li>1. Atomic and Ionic Radii</li><li>2. Ionization Potential or Energy</li><li>3. Electron affinity</li><li>4. Electronegativity</li></ol></li><li>▪ Pauli's method for the determination of ionic radius of isoelectronic ions and problems based on it</li></ul>	06
4	<p><b>Bonding and Shapes of Molecules</b></p> <ul style="list-style-type: none"><li>▪ Valence Bond Theory and its limitations</li><li>▪ Hybridization – Concept of hybridization<ol style="list-style-type: none"><li>1. <math>sp</math> {<math>C_2H_2</math>, <math>BeCl_2</math>}</li><li>2. <math>sp^2</math> {<math>BF_3</math>, <math>C_2H_4</math>}</li><li>3. <math>sp^3</math> {<math>CH_4</math>}</li><li>4. <math>sp^3d</math> {<math>PCl_5</math>}</li><li>5. <math>sp^3d^2</math> {<math>SF_6</math>}</li></ol></li><li>▪ Stereochemistry of inorganic molecules<ol style="list-style-type: none"><li>1. Sidgwick Powell Rule</li><li>2. VSEPR Theory</li></ol></li></ul>	06



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5	<b>Properties of First Transition Metal Series</b> <ul style="list-style-type: none"><li>▪ Introduction, Electronic Configuration and definition</li><li>▪ Reversal of Energies of 3d and 4s orbitals</li><li>▪ Atomic Properties<ol style="list-style-type: none"><li>1. Atomic and Ionic Radii</li><li>2. Ionization Potential</li><li>3. Oxidation states and their stability</li></ol></li><li>▪ Magnetic Properties<ol style="list-style-type: none"><li>1. Spectral Properties</li><li>2. Nonstoichiometric</li><li>3. Interstitial Compounds</li></ol></li><li>▪ Types of Physical Properties<ol style="list-style-type: none"><li>1. Metallic</li><li>2. Crystal Structure</li><li>3. Conductivity</li><li>4. Catalytic Properties</li><li>5. Tendency of Formation of Alloys</li></ol></li></ul>	08
6	<b>Physical Chemistry:</b> <b>Thermodynamics</b> <ul style="list-style-type: none"><li>▪ Definition of thermodynamics term: system, surroundings</li><li>▪ Types of systems</li><li>▪ Intensive and extensive properties</li><li>▪ State and path functions and their differential</li><li>▪ Thermodynamic processes</li><li>▪ Concept of heat and work</li><li>▪ First Law of Thermodynamics: Statement &amp; Mathematical form</li><li>▪ Definition of internal energy and enthalpy</li><li>▪ Calculation of <math>w</math>, <math>q</math>, <math>\Delta E</math> &amp; <math>\Delta H</math> for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process</li><li>▪ Bond dissociation energy and its calculation from thermochemical data</li><li>▪ Work obtained during adiabatic and isothermal change</li><li>▪ Heat capacity: heat capacities at constant volume and pressure and their relationship <math>C_p - C_v = R</math></li><li>▪ Zeroth Law: mathematical treatment of Zeroth law and its limitation and various statements of law</li><li>▪ Joule's law-joule Thomson coefficient and inversion temperature (only definition)</li></ul>	11
7	<b>Adsorption</b> <ul style="list-style-type: none"><li>▪ Introduction</li><li>▪ Types of adsorption</li><li>▪ Uses of adsorption</li><li>▪ Langmuir adsorption isotherms at high &amp; low pressure and its limitations</li></ul>	09



	<ul style="list-style-type: none"><li>▪ Freundlich adsorption isotherms and its limitations</li></ul>	
8	<p><b>Analytical Chemistry:</b> <b>Modes of Concentration[Concentration Concept with Numerical]</b></p> <ul style="list-style-type: none"><li>▪ Preparation of Standard Solutions<ol style="list-style-type: none"><li>1. Equivalent weight of acid and base</li><li>2. Equivalent weight of acid salt</li><li>3. Equivalent weight of an ion</li></ol></li><li>▪ Molarity with numerical</li><li>▪ Normality with numerical</li><li>▪ Molality with numerical</li><li>▪ Strength of solutions</li><li>▪ % concentration w/v</li><li>▪ Weight Fraction</li><li>▪ Volume Fraction</li></ul>	10
9	<p><b>Acids and Bases</b></p> <ul style="list-style-type: none"><li>▪ Degree of hydrolysis (h)</li><li>▪ Derivation of Hydrolysis constant (kh)</li><li>▪ pH of salt of<ol style="list-style-type: none"><li>1. Strong acid-weak base</li><li>2. Strong base- weak acid</li><li>3. Weak acid-weak base</li></ol></li><li>▪ Buffers solution- Buffer capacity</li><li>▪ Mechanism of acidic and basic buffer solution</li><li>▪ Numerical – Calculation of pH of Buffer solutions</li><li>▪ Derivation of equation for pH of acidic and basic buffer solution</li></ul>	10

### Learning Outcomes:-

The students are able to:

- Analyze the acids and bases.
- Learn the basics of 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.**



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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**.



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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', **N Kundu and S.K Jain.**
15. 'Physical Chemistry', **KL Kapoor.**
16. 'Thermodynamics', **Gurudeep Raj.**
17. 'Comprehensive Physical Chemistry', **HemandSnehi.**
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', **ChatwalAnand.**
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>
3. <http://www.chemguide.co.uk/atoms/properties/gcse.html>
4. [http://en.wikipedia.org/wiki/Chemical\\_bond](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](http://en.wikipedia.org/wiki/Nuclear_chemistry)
9. [http://www.chem.duke.edu/~jds/cruise\\_chem/nuclear/nuclear.html](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](http://www.visionlearning.com/library/module_viewer.php?mid=59)
12. [http://en.wikipedia.org/wiki/Chemical\\_thermodynamics](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](http://en.wikipedia.org/wiki/Laws_of_thermodynamics)

## **FACULTY OF SCIENCE**



# C. U. SHAH UNIVERSITY

## DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: I

SUBJECT NAME: Chemistry Practical-I

SUBJECT CODE: BSCCHP101

Teaching & Evaluation Scheme:-

Teaching Scheme(hrs)			Evaluation Scheme								
Th	Pr	Total	Theory					Practical (Marks)			Total
			Sessional Exam		University Exam		Total	External	Internal	Total	
			Marks	Hrs	Marks	Hrs					
0	6	6	--	--	--	--	--	30	20	50	50

Course outline:-

Sr. No.	Course Contents
1	<b>Organic Qualitative Analysis</b> [15 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	<b>Volumetric Analysis</b> <ol style="list-style-type: none"><li>To prepare solution of acids and bases with definite concentration</li><li>To prepare a solution by dissolving 'x' gms <math>\text{NaHCO}_3</math> / <math>\text{Na}_2\text{CO}_3</math> in 100 ml solution and determine its concentration in terms of normality and molarity using the given 0.1 M HCl solution</li><li>To determine the normality, molarity and gms/litre of <b>NaOH and HCl</b> using 0.05M <math>\text{Na}_2\text{CO}_3</math> solution</li><li>To determine the molarity, g/litre and normality of each component in a given mixture of <b>NaHCO<sub>3</sub> and Na<sub>2</sub>CO<sub>3</sub></b> the using 0.1 M HCl solution</li><li>To determine the molarity, g/litre and normality of each component in a mixture of <b>H<sub>2</sub>C<sub>2</sub>O<sub>4</sub>.2H<sub>2</sub>O and H<sub>2</sub>SO<sub>4</sub></b> using 0.02 M <math>\text{KMnO}_4</math> and 0.1 M NaOH solution</li><li>To determine the molarity, g/litre and normality of each component in a mixture of <b>H<sub>2</sub>C<sub>2</sub>O<sub>4</sub>.2H<sub>2</sub>O and K<sub>2</sub>C<sub>2</sub>O<sub>4</sub>.H<sub>2</sub>O</b> using 0.1 M NaOH and 0.02 M <math>\text{KMnO}_4</math> solution</li><li>To determine the molarity, g/litre and normality of <b>KMnO<sub>4</sub> and FeSO<sub>4</sub>.7H<sub>2</sub>O</b> solution using 0.05 M <math>\text{H}_2\text{C}_2\text{O}_4.2\text{H}_2\text{O}</math> solution</li></ol>
3	<b>Demonstrative practicals:</b>





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- |  |                                                                                                                                                                                                                             |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>• <b>Calibration of Glassware</b> (Burette &amp; Pipette)</li><li>• <b>Crystallization of Organic compounds</b> (3-4 compounds)</li><li>• <b>Calibration of Thermometer</b></li></ul> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|