

BHAKTA KAVI NARSINH MEHTA UNIVERSITY



FACULTY OF SCIENCE

Chemistry

B. Sc. SEMESTER – 4

Effective From June-2017

Bhakta Kavi Narsinh Mehta University

Junagadh-362263

Website: www.bknmu.edu.in

Subject: Chemistry

Faculty: Science

Semester: 4

Sr. No	Level UG or PG	Sem	Course Group Core Elective-1 Elective-2 Allied /SEC/DSE	Course (Paper) Title	Paper No.	Credit	Teaching Hours	Internal Marks	External Marks	Practical internal Marks	Practical external Marks	Total Marks
1	UG	4	Core	Chemistry (Theory)	C-401	4	60	30	70	-----	-----	100
2	UG	4	Core	Chemistry (Practical)	C-402	2	-----	-----	-----	15	35	50

Unit wise Distribution

Unit-I	Inorganic	[12-hours]
Unit-II	Inorganic	[08-hours]
Unit-II	Organic	[04-hours]
Unit-III	Organic	[12-hours]
Unit-IV	Organic	[04-hours]
Unit-IV	Physical	[08-hours]
Unit-V	Physical	[12-hours]
	TOTAL	60 hours

**BHAKTA KAVI NARSINH MEHTA
UNIVERSITY B. Sc. SEMESTER – IV**

EFFECTIVE FROM JUNE - 2017

C-401

4 CREDITS

[Unit-I]

1. **Organometallic compounds** **[6 hours]**
Introduction, Classification based on nature of M-C Bond and hapticity.
Preparation, Properties and uses of Organo Lithium compounds and organo magnesium compounds
Preparation, bonding & structure of Zeise Salts, Tri Methyl aluminium (dimer), Ferrocene
2. **Bioinorganic chemistry** **[6 hours]**
Metalloporphyrins, structure and role of Hemoglobin in biological system, myoglobin, structure of chlorophyll and its importance, toxicity of arsenic, mercury, lead and cadmium, reason for toxicity.

[Unit-II]

3. **Noble gases** **[8 hours]**
Introduction, Occurrence, Compounds of inert gas;
Preparation, structure (VBT) and properties of XeF_2 , XeF_4 , XeF_6 , XeOF_4 , XeO_2F_2 , XeOF_2 , KrF_2 , oxide of xenon – XeO_3 , XeO_4 , use of Noble gases.
4. **Active methylene compounds:** **[4-hours]**
Definition, Keto-enol Tautomerism in Ethyl acetoacetate,
Preparation of Ethyl acetoacetate [Claisen Condensation with reaction mechanism]
Chemical Reactions of Ethyl acetoacetate: [Reduction, hydrolysis (with dil. H_2SO_4 , with ethanolic KOH), with sodium ethoxide, reaction with alkylhalide, Reaction with NaHSO_3 and HCN, reaction with Aldehydes]
Synthesis from Ethyl acetoacetate
 - Monocarboxylic acid: Butyric acid and Valeric acid
 - Ketone : 2-Pentanone and 3- Methyl 2-pentanone
 - α , β – unsaturated acid : Crotonic acid
 - Dicarboxylic acid: Adipic acid
 - Diketone: Acetyl acetone and Acetonyl acetone,
 - Keto acid: Levulinic acid

[Unit-III]

5. Carbonyl Compounds (Aldehydes & ketones): [6-hours]

Structure, reactivity and Preparation of aldehydes and ketones: from acid chlorides and from nitriles.

Reactions: Nucleophilic additions (with HCN, ROH, NaHSO₃), Nucleophilic addition-elimination reactions (with ammonia derivatives with mechanism), oxidations and reductions (Clemmensen, Wolff-Kishner, LiAlH₄, NaBH₄.)

6. Carboxylic Acids and their Derivatives: [6-hours]

Carboxylic acids:

Acidity of Carboxylic acids, Effect of substituents on Acidity of carboxylic acids

Preparation of monocarboxylic acids (by hydrolysis of acid derivatives)

Reactions of monocarboxylic acids: Salt formation, Decarboxylation, Halogenation – Hell Volhard Zelinsky Reaction

Carboxylic acid derivatives

Preparation of Acid chlorides, Anhydrides, Esters and Amides from carboxylic acids and their inter-conversion

Mechanism of Esterification

Hydrolysis of Esters (B_{AC}2 Mechanism)

[Unit-IV]

7. Name Reaction and Rearrangements-II: [4-hours]

Name Reaction: Aldol condensation, Perkin Reaction, Wittig reaction

Rearrangement: Beckmann Rearrangement, Benzil-Benzilic acid Rearrangement, and Hofmann bromamide degradation.

8. Physical Properties and Molecular Structure: [8-hours]

Introduction

Types of Physical Properties: Additive and Constitutive Properties

Molar Volume: Kopp's Law, Atomic Volume

Surface Tension: Explanation of Surface Tension, Name of Methods to Determine Surface Tension, The Drop Weight Method

Parachor: Macleod Equation and $P_1/P_2 = V_1/V_2$, Atomic Parachor, To Determine Structure of (i) Quinine (ii) Benzene (iii) Isocyanides group (iv) Nitro group

Viscosity: Explanation (Briefly), Unit and Factors Affecting the Viscosity, Measurement of Viscosity (Derivation of $\eta_1 / \eta_2 = d_1 t_1 / d_2 t_2$), Ostwald's Viscometer

Refractive Index and Refractivity: Introduction, Specific and Molecular Refractivity, Abbe Refractometer, Molecular Refractivity and Chemical Constitution

Optical Activity: Polarization of Light, Optical Activity, Factors Affecting Angle of Rotation, Specific Rotation, Polarimeter

Dipole Moment: Polar and Non-polar molecule, Electric Polarization (Polarizability of Molecules), The Mosotti Clausious Equation, Kinds of Molar Polarization [Electron & Nuclear Polarization, Orientation Polarization (Permanent Dipole Moment)]; Application of Dipole Moment: Identification of Polar and Non-polar molecules, Molecular Structure :(i) Mono atomic molecules, (ii) Diatomic molecules (iii) Triatomic molecules (CO_2 , H_2O , SO_2) (iv) Tetratomic molecules (NH_3 , BCl_3) (v) Aromatic Compounds (Benzene) (vi) Resonance Structure (N_2O) (vii) Cis-Trans Isomer (viii) Orientations in Organic Molecules (o, m and p substitution),

Numericals

[Unit – V]

9. Thermodynamics:

[12 hours]

Introduction, Limitations and Advantages of Thermodynamics,
Types of Systems, State Variables, properties of System: Extensive and Extensive Properties,
Types of Processes, State and Path Functions,
Exact and Inexact Differential Concept of Heat, Work and Internal Energy,
First Law of Thermodynamics: Statements, Mathematical derivation, Heat absorbed at constant volume, Perpetual Machine of First Kind,
Enthalpy, Heat Capacity: Its types and derivation of relation ($C_p - C_v = R$),

Isothermal Reversible and Irreversible Work of Ideal Gas, Proof: $W_r > W_{irr}$,
Relations between $P - V$, $V - T$ and $T - P$ for Adiabatic Process, Adiabatic Reversible and Irreversible work of Ideal Gas,

Joule Thomson Effect, Joule Thomson Coefficient, Joule Thomson of Ideal Gas, Zeroth Law (Only Statement and Explanation), Variation of Enthalpy with Temperature (Kirchhoff Equation), Flame and Explosion Temperature, Numericals

Reference book:

1. Quantum chemistry by A. K. Chandra
2. Basic Concept of Quantum Chemistry by R. K. Das.
3. Molecular Physical Chemistry by McQuarrie
4. UGC Inorganic Chemistry - H. C. Khera (Pragati Prakashan)
5. Principles of Inorganic chemistry – Puri, Sharma & Kalia.
6. Concise Inorganic Chemistry - J. D. Lee
7. Advanced Inorganic Chemistry- Cotton and Wilkinson
8. Basic Inorganic Chemistry - Gurdeep & Chatwal
9. Organic Chemistry (Volume I, II & III) by S.M. Mukherji, S.P. Singh and R.P. Kapoor
10. A Text Book of Organic Chemistry (II Edition) by Raj K. Bansal
11. Name Reactions in Organic Synthesis by Dr. A.R.Parikh et. al
12. Reactions and Rearrangements by Gurdeep Chatwal
13. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tli and Arun Bahl, S. Chand & Co.. New Delhi.
14. Elements of Physical Chemistry, Late B.R. Puri, L. R. Sharma and Madan Pathania, Vishal Publishing Co. Jalandhar.
15. Principles of Physical Chemistry, Samule H. Maron and Carl F. Prutton, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
16. Physical Chemistry, B. K. Sharma, Goel Publication House. Meerut.
17. Elements of Physical Chemistry, Samuel Glasstone and David Lewis, Macmillan & Co.

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

B. Sc. SEMESTER – IV

CHEMISTRY PRACTICALS EFFECTIVE FROM JUNE-2017

C-402

2 CREDITS

50 Marks

Ma

I. Inorganic Qualitative Analysis:

[20 Marks]

[Minimum ten inorganic mixtures should be given]

Qualitative Analysis of an inorganic mixture containing four radicals, excluding PO_4^{-3} , CrO_4^{-2} , $\text{Cr}_2\text{O}_7^{-2}$, AsO_3^{-3} , AsO_4^{-3} , BO_3^{-3} and S^{-2}

II. Physicochemical Exercise

[15 Marks]

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ Ethyl acetate catalyzed by H^+ ion at room temperature.
2. To study the rate of reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI.
3. To study the rate of reaction between KBrO_3 and KI.
4. To determine the temperature coefficient and Energy of activation for the hydrolysis of ester at two different temperatures.
5. To determine the temperature coefficient and Energy of activation for the reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI at two different temperatures
6. To determine the rate of adsorption of the given organic acid using animal charcoal.
7. Distribution Law: To study the partition co-efficient of benzoic acid between water and benzene / kerosene and hence study the molecular condition of benzoic acid in the solution.
8. To study the partition co-efficient of acetic acid between water and chloroform and hence study the molecular condition of acetic acid in the solution.

III. Continuous Internal Assessment

[15 Marks]

Bhakta Kavi Narsinh Mehta University, Junagadh

B. Sc. Examination

Effective from June - 2018

Total mark: 70

Paper style New Course

Subject: Chemistry

Time: 2:30 hours

**All the questions are
compulsory.**

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- Q. 1 (a) Answer the following question. [UNIT-I] (4)**
(1)
- Q. 1 (b) Answer any two questions out of three. [UNIT -I] (10)**
(1)
(2)
(3)
- Q. 2 (a) Answer the following question. [UNIT-II] (4)**
(1)
- Q. 2 (b) Answer any two questions out of three. [UNIT-II] (10)**
(1)
(2)
(3)
- Q. 3 (a) Answer the following question. [UNIT-III] (4)**
(1)
- Q. 3 (b) Answer any two questions out of three. [UNIT-III] (10)**
(1)
(2)
(3)
- Q. 4 (a) Answer the following question. [UNIT-IV] (4)**
(1)
- Q. 4 (b) Answer any two questions out of three. [UNIT-IV] (10)**
(1)
(2)
(3)
- Q. 5 (a) Answer the following question. [UNIT-V] (4)**
(1)
- Q. 5 (b) Answer any two questions out of three. [UNIT-V] (10)**
(1)
(2)
(3)