

Krantiguru Shyamji Krishna Verma

Kachchh University

Mundra Road

BHUJ : 370 001



SYLLABUS

B. Sc. Semester VI: (SIX)

CHEMISTRY

THREE Papers:

Code No: CECH-610 (Structural Chemistry)

Code No: CECH-611 (Analytical Chemistry)

Code No: CECH-612 (Applied Chemistry)

With effect from NOVEMBER -2016

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KACHCHH UNIVERSITY: BHUJ
B.Sc. SEMESTER: VI (SIX) CHEMISTRY PAPER : X (wef Nov- 2016)
Paper Code NO. : CECH-610 (STRUCTURAL CHEMISTRY) M. M. : 60
Examination Time : Two Hours

UNIT : I**Symmetry :** (15 M)

Symmetry Operations and Symmetry elements (C_n , σ , S_n , i), Multiplication Table C_{2v} , C_{2h} and C_{3v} point groups, Classification of Schoenflies Point groups : C_1 , C_s , C_i , C_n , C_{nh} , C_{nv} , D_n , D_{nh} , D_{nd} , T_d and O_h , Matrix representation of C_n , σ , S_n , i , E
 Symmetry and Dipole moment, Symmetry and Optical activity.

Ref books :

- (1) Physical Chemistry by Daniels and Alberty, 4th Ed, pages 434-446
- (2) Chemical Applications of Group theory by F A Cotton, 2nd Ed, pages 14-32, 33-38, 45-52, 62-73.
- (3) Introductory Quantum Chemistry : A K Chandra, 3rd Ed, page 252-273
- (4) Chemical Bonding : An Introduction : A K Raval, KC Patel, & R D Patel : 2nd Ed, Pages 149-189

UNIT :II**(A) Term symbols** (8M)

Russel Saunders Coupling and determination of Term symbols in Ground state, Pigeon Hole diagram of p^2 and d^2 , Hund's rules, Hole formalism, Calculation of number of microstates.

Ref books :

- (1) Concise Inorganic Chemistry : J D Lee, 4th Ed, pages 938 to 950

(B) Electronic Spectra of Metal Complexes : (7M)

Electronic Spectra of Transition metal complexes, Selection rules, Laporte Orbital Selection rules, Spin selection rule, Orgel combined energy level diagram ($d^1 - d^9$, $d^2 - d^8$ only) and their spectra, Spectra of d^5 , Jahn Teller distortions, Spectro chemical series, Vibronic coupling.

Ref books :

- Concise Inorganic Chemistry : J D Lee, 4th Ed, pages 951 to 967

UNIT : III**(A) Mossbauer Spectroscopy :** (8 M)

Principle, Experimental technique and applications

Ref Books :

- (1) Physical Methods in Inorganic Chemistry : R S Drago, pages : 362 – 372
- (2) Basic principles of Spectroscopy : R Chang : page 90 – 103
- (3) Fundamentals of Spectroscopy : C N Banwell, Reprint . pages 313 – 323

(B) IR and Raman Spectra of Inorganic molecules :**(7 M)**

IR Spectra : Basic principle, Instrumentation, Applications of IR spectra in structural determination of simple diatomic and tri atomic molecules like HCl, H₂O, CO₂ , SO₂ NO₂ and Cl₂O

Raman Spectra : Basic , Instrumentation, Applications , Comparison of IR with Raman spectra.

Ref Books :

Basic Principles of Spectroscopy : R Chang , pages : 149 – 167 , 182- 185

Physical methods in Inorganic Chemistry : R S Drago

Fundamentals of Molecular spectroscopy : C N Banwell

UNIT : IV : Spectroscopy for Organic Molecules :**(A) NMR Spectroscopy :****(8 M)**

Principle , Equivalent and non-equivalent protons, Chemical shift and factors affecting it, Relative intensity of signals, Spin-spin coupling, coupling constant, Deuterium labeling , Application including determination of Aromatic Character, Carbocation , Examples.

(B) Infra Red Spectroscopy :**(7 M)**

Introduction, Various types of vibrations, Sample preparation, Group frequencies, Applications in Structural determination including H-bond, tautomers and geometrical isomers , Finger print region, Examples .

Problems based on the combined applications of UV, IR and NMR spectroscopy must be asked . See pattern of question paper on the following page no. 4 .

Reference Books :

- (1) Applications of Absorption Spectroscopy of Organic Compounds : J R Dyer
 - (2) Organic Chemistry : VI th Ed, Morrison and Boyd
 - (3) Spectro photometric Identification of Organic Compounds : R M Silverstein ,
G C Bassler & T C Morrill : 4 th Ed. John Wiley & Sons
 - (4) Spectroscopy of Organic Compounds : P S Kalsi : 6th Ed, New Age International
 - (5) Organic Spectroscopy : William Kemp, 2nd Ed, ELBS
 - (6) Elementary Organic Absorption Spectroscopy : Y R Sharma & O P Vig .
S.Chand & company, New Delhi
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Pattern of Question paper for semester-end Examination. Paper code: CECH: 610

Total Marks : 60 , Duration : **TWO** Hours , Passing standard : 40% ie 24 Marks

Internal options are compulsory (i.e. Q.1 or Q.1; Q.2 or Q.2 etc. or attempt any 2 or any 3 out of given four or five)

There are four questions (Q. 1 to Q. 4) each carrying 15 marks. One main question from every unit.

The structure for the questions is as under:

Questions	Section	Marks
Question – 1 Unit – I	A (Short answer , <i>no internal option</i>)	5 marks
	B (Descriptive - Essay type - Short notes <i>with internal option</i>)	10 marks
Question – 2 Unit –II	A –do-	5 marks
	B –do-	10 marks
Question – 3 Unit – III	A –do-	5 marks
	B –do-	10 marks
Question – 4 Unit – IV OR Q.4 No A and B parts. Two problems out of Four problems. 15 Marks	A –do-	5 marks
	B –do- OR (B) One problem based on the combined applications of UV, IR and NMR. One out of two problems will have to be solved with explanation of data. OR Entire Q.4. TWO problems based on the combined applications of UV, IR and NMR. Two out of four problems will have to be solved with explanation of data. (15 Marks)	10 marks

Types of questions for section A are varied: like: one or two line answers/ definitions / reasoning/ mathematical equations/drawing small figures/ matching the answers etc.

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KACHCHH UNIVERSITY: BHUJ
B.Sc. SEMESTER: VI (SIX) CHEMISTRY PAPER: XI (wef Nov- 2016)
Paper Code NO. : CECH-611 (ANALYTICAL CHEMISTRY) M. M. : 60
Examination Time : Two Hours

UNIT I :

(A) Treatment of analytical data : (5 M)

Significant figures, Accuracy, Precision, Types of errors and minimization of errors, Ways of expressing accuracy and precision, rejection of result, Test of significance (Q. test, students t-test and F-test), Correlation coefficient.

(B) Theory of precipitation: (5 M)

Formation of precipitates, Particle size of precipitates, Impurities in precipitates, Purification of precipitates, Precipitation from homogeneous solution, Precipitation titrimetry, Mohr's method, Volhard method , Fajan method, construction of titration curve, Factors influencing the sharpness of end point

(C) Polarography : (5 M)

Principle, Electrodes, Types of current, Half wave potential, Ilkovic equation, Method of determining concentration.

UNIT : II :

(A) Redox Titrations : (7M)

Calculation of potential at various point on the titration curve, Redox indicators, Potential requirements of oxidation reduction titrations, Multicomponent titrations, Iodometry and Iodimetry , Metal reductors.

(B) Potentiometry : (8M)

The scope of potentiometric titrations, Precipitation and neutralization titrations, Graphical methods including Gran's plot for selecting end point, Differential titrations, Dead stop titrations, Ion selective electrodes, Types of ion selective electrode, working and use of Calcium ion selective electrode, Principle of pH meter.

UNIT: III

(A) Acid – Base titrations : (7 M)

Titration of polyprotic acids, and mixture of acids, Titration of salts, Differential alkali titrations, Buffer solution, Buffer level, Buffer range, Buffer efficiency, Buffer capacity.

(B) Complexometric titration : (8 M)

Types of titrations, Different indicators, pH effect, Hydrolysis effect, Ligand effect, Masking & demasking, construction of titration curve

UNIT : IV**(A) Chromatography:****(8 M)**

Adsorption chromatography, Paper chromatography, Thin Layer chromatography, Gas chromatography, Instrumentation and evaluation of data, High performance liquid chromatography (HPLC-Principle, Instrumentation and applications)

(B) Ion exchange resin :**(7M)**

Ion exchange equilibrium, Types of ion exchange resins, Ion exchange capacity, Applications of Ion exchange resins.

Ref Books in general :

- (1) Instrumental Methods of Chemical Analysis: B K Sharma: Goel Publishing House, Merrut
- (2) Quantitative Analysis : Day and Underwood
- (3) Fundamentals of Analytical Chemistry : Skoog and West
- (4) Analytical Chemistry : IV th Ed. Gary D Christian .

Pattern of Question paper for semester-end Examination. Paper code: CECH-611

Total Marks : 60 , Duration : **TWO** Hours , Passing standard : 40% ie 24 Marks

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	B (Descriptive - Essay type - Short notes <i>with internal option</i>)	10 marks
Question – 2 Unit –II	A –do-	5 marks
	B –do-	10 marks
Question – 3 Unit – III	A –do-	5 marks
	B –do-	10 marks
Question – 4 Unit – IV	A –do-	5 marks
	B –do-	10 marks

Types of questions for section A are varied: like: one or two line answers/ definitions / reasoning/ mathematical equations/drawing small figures/ matching the answers etc

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KACHCHH UNIVERSITY: BHUJ
B.Sc. SEMESTER: VI (SIX) CHEMISTRY PAPER: XII (wef Nov- 2016)
Paper Code NO. : CECH-612 (APPLIED CHEMISTRY) M. M.: 60 Examination
Time : Two Hours

UNIT : I**(A) Types of Analytical methods :** (5 M)

Introduction, Branches of Chemistry , Analytical Chemistry, Importance of Analytical Chemistry, Classification of Analytical methods, Advantages and limitations of Chemical methods and Instrumental methods, Literature of Analytical Chemistry including Chemical abstract , Names of few reference books and Journals on Analytical Chemistry.

(B) Solvent Extraction : (6 M)

Distribution coefficient, Distribution ratio, Solvent extraction of metals, Extraction process, Separation efficiency , Choice of solvent.

(C) Ceramic Industries : (4 M)

Classification of Ceramic products, Basic raw material in ceramic industries, fluxing agents, Glazing Porcelain

UNIT : II**(A) Colorimetry and Spectro photometry :** (6 M)

Laws of absorption, Spectrophotometric instrument, Light sources, Optical system, Wavelength selector, Light sensitive devices, Accuracy and error of spectrophotometry, Analysis of mixtures.

(B) Flame Photometry and AAA : (6 M)

Flame emission spectroscopy, and Atomic absorption spectroscopy, Principle and comparison, Inductively coupled plasma emission spectroscopy , Burners (Total consumption burner and pre mix burners)

(C) Desalination or Reverse Osmosis : (3 M)**UNIT : III****(A) Fuel cell :** (5 M)

Gemini cell, Bacon cell, Electrodes and Electrolytes used in fuel cell, Classification based on temperature, Efficiency of fuel cell, Hydrocarbon fuel cell, Methanol fuel cell, Hydrazine fuel cell, Air depolarized cell, Use of porous electrodes in fuel cell, Electrochemistry of fuel cell.

(B) Metallic Corrosion : (5M)

Types of corrosion, Electrochemical series, Differential aeration principle, Corrosion in acidic medium, Corrosion in neutral medium, Prevention of corrosion by various methods, Polarization and types of polarization, Factors affecting corrosion, Atmospheric corrosion, Effect of moisture and pollutants on corrosion rate.

(C) Anodic/ Cathodic technical reactions : (5 M)

Current efficiency, Energy efficiency, Advantages of electro-chemical methods, Electrolysis of NaCl in different conditions, Electroplating and production of metal powder, Preparation of organic compounds: Aniline, Mannitol and Inorganic compounds : KMnO_4 , $\text{K}_2\text{S}_2\text{O}_8$, $\text{K}_3[\text{Fe}(\text{CN})_6]$, H_2O_2 .

Electrochemistry and Pollution Control

UNIT: IV**(A) BIO INORGANIC CHEMISTRY:****(5 M)**

Role of Myoglobin and Hemoglobin in biological system, cooperative effect. Metallo enzymes, Inhibition and poisoning of enzymes, Role of alkali and alkaline earth metal ions in biological systems, Sodium pump, Calcium pump, Biological junction and toxicity of some elements, Biological fixation of nitrogen.

(B) Synthetic Perfumes :**(3 M)**

Definition, Vehicle, Fixative, Odorous substances, Classification, Synthesis of (1) Methyl anthranilate (2) Phenyl alcohol (3) Linalool (4) Musk Ketone (5) α and β -Ionones (6) Vanilline

Ref: Synthetic Organic Chemistry: O.P. Agarwal

(C) Synthetic Drugs:**(7 M)**

Chemotherapy, Synthesis and use of (1) Sulphathiazole (2) Sulphadiazine (3) Benzocaine (4) Paracetamol (5) Para amino salicylic acid (PAS) (6) Phenacetin (7) Antipyrine (8) Tolbutamide (9) Chloramine-T (10) n-Hexyl resorcinol.

Ref : (1) A text book of Pharmaceutical Chemistry –II : Dr. A V Kasture & Dr. S G Wadodkar : Nirali Prakashan

(2) Organic Pharmaceutical Chemistry: Harkishan Singh & V K Kapoor : Vallabh Prakashan, Delhi

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Pattern of Question paper for semester-end Examination. Paper code : CECH : 612

Total Marks : 60 , Duration : **TWO** Hours , Passing standard : 40% ie 24 Marks

Internal options are compulsory (i.e. Q.1 or Q.1; Q.2 or Q.2 etc. or attempt any 2 or any 3 out of given four or five)

There are four questions (Q. 1 to Q. 4) each carrying 15 marks. One main question from every unit.

The structure for the questions is as under:

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Question – 2 Unit –II	A –do-	5 marks
	B –do-	10 marks
Question – 3 Unit – III	A –do-	5 marks
	B –do-	10 marks
Question – 4 Unit – IV	A –do-	5 marks
	B –do-	10 marks

Types of questions for section A are varied: like: one or two line answers/ definitions / reasoning/ mathematical equations/drawing small figures/ matching the answers etc.

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PRACTICALS

KACHCHH UNIVERSITY: BHUJ

B.Sc. SEMESTER: VI (SIX) CHEMISTRY PAPER: X (wef Nov- 2016)

Paper Code NO. : CECH-610 P (STRUCTURAL CHEMISTRY) M. M. : 30

(A) Inorganic Gravimetric : (17 M)

Gravimetric determination of the metal after removing one impurity metal

- (1) $\text{BaCl}_2 + \text{FeCl}_3 + \text{HCl}$ (Estimation of Ba as BaSO_4 , after removal of Iron)
- (2) $\text{MnCl}_2 + \text{CuCl}_2 + \text{HCl}$ (Estimation of Mn as $\text{Mn}_2\text{P}_2\text{O}_7$, after removing Copper)
- (3) $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 + \text{CuSO}_4 + \text{H}_2\text{SO}_4$ (Estimation of Iron as Fe_2O_3)
- (4) $\text{Al}_2(\text{SO}_4)_3 + \text{CuSO}_4 + \text{H}_2\text{SO}_4$ (Estimation of Al as Al_2O_3 , after removing Copper)
- (5) Analysis of Brass (Cu Volumetrically and Zn gravimetrically)
- (6) Analysis of German Silver (Cu volumetrically and Ni as Gravimetrically)

(B) Inorganic Volumetric analysis : (10 M)

- (1) Estimation of Fe^{+3} by EDTA
- (2) Determination of Bi^{+3} by EDTA
- (3) %age purity of H_2O_2 by Iodometric method
- (4) Estimation of Cl^{-1} by Silver nitrate (Mohr's method)
- (5) Estimation of Zn^{+2} & Cd^{+2} in a mixture by EDTA
- (6) Estimation of Ca^{+2} & Mg^{+2} in a mixture by EDTA

(C) Journal + Viva : (3 M)

PRACTICALS

KACHCHH UNIVERSITY: BHUJ

B.Sc. SEMESTER: VI (SIX) CHEMISTRY PAPER : XI (wef Nov- 2016)

Paper Code NO. : CECH-611 P (ANALYTICAL CHEMISTRY) M. M. : 30

(A) Physico-Chemical Exercise:

One exercise be given from the following to the candidate at the examination: (24M)

(a) Colorimetry :

- (1) To study Beer's law and to determine the concentration of (i) Cu^{+2} (ii) CrO_4^{-2}
- (iii) Fe^{+3} in unknown solution.

(b) Distribution law :

- (1) To study the distribution of Ammonia between Water and Chloroform
- (2) To study the distribution of Ammonia between Water and Carbon tetra chloride

(c) Thermo chemistry :

- (1) To determine the heat of solution of an organic acid (Benzoic acid, Salicylic acid, Succinic acid)

(B) Journal : (3 M)

(C) Viva : (3 M)

PRACTICALS**KACHCHH UNIVERSITY: BHUJ****B.Sc. SEMESTER: VI (SIX) CHEMISTRY PAPER : XII (wef Nov- 2016)****Paper Code NO. : CECH-612 P (APPLIED CHEMISTRY) M. M. : 30**

(A) Organic Estimation : (17M)

- (1) To find out Mol. Wt of Organic acid by titrimetry method
- (2) To find out basicity of organic acid by titrimetry method
- (3) To find out the %age purity of the sample of organic acid
- (4) To find out the amount of Acetone in the given solution by iodine method
- (5) To find out amount of Ethyl acetate by hydrolysis method
- (6) To find out saponification value of an oil.
- (7) To find out %age purity of Ethyl acetate by hydrolysis method

(B) Chromatography : (7 M)

- (1) Separation of 1st and 2nd groups ions
- (2) Separation of Dyes
- (3) Separation of Amino acids by ascending paper chromatography and TLC

(C) Journal : (3 M)**(D) Viva : (3 M)**

KSKV Kachchh University : BHUJ**B.Sc. Sem : VI : Term End (University) Examination (wef June 2016)****Subject : CHEMISTRY**

Duration : TWO days Time : Seven hours a day

Day 1 : (1) Gravimetric Analysis (7.0 Hrs) 17 M + 3 M Journal + Viva
(2) Volumetric Analysis (10 M)

Day 2 : (1) Physical exercise (3.5 Hrs) 24 Marks + 3 M Journal + 3 M Viva
(2) Organic Estimation (2.5 Hrs) : 20 M + 3 M Journal + 2 M Viva
(3) Chromatography (1.0 Hrs) : 5 M

Structure :

Day/date	Exercise	Exercise
Day 1 9.00 am to 12.30 pm	Physico-Chemical exercise	Gravimetric exercise
1.00 pm to 4.30 pm	Organic estimation , Chromatography , Viva	Gravimetric (contd) Volumetric analysis
Day 2 9.00 am to 12.30 pm	Gravimetric exercise	Physico-Chemical exercise
1.00 pm to 4.30 pm	Gravimetric (contd) Volumetric analysis	Organic estimation , Chromatography , Viva

Thus : 3 papers x 30 marks = 90 marks

NB: Three separate mark sheets will be prepared one for each paper nos.

CECH : 610 P , CECH : 611 P and CECH : 612 P

15/3/2016