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SYLLABUS

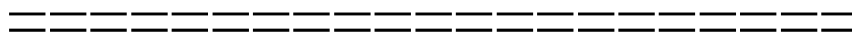
B. Sc. Semester III : (THREE)

CHEMISTRY

TWO Papers : Code No : CECH-303 (Inorganic Chemistry)

Code No : CECH-304 (Organic Chemistry)

With effect from June 2016



KACHCHH UNIVERSITY : BHUJ
SEMESTER : III (THREE)
CHEMISTRY PAPER : III (wef June 2016)
Paper Code NO. : CECH-303 (INORGANIC CHEMISTRY)

UNIT : I : WAVE MECHANICS : [15]

Wave postulates of quantum mechanics, wave function and its interpretation. Operators (linear Hermitian, their addition subtraction and multiplication). Commutators, setting up of operators for different observables (physical quantities) like position x-component of momentum(Px), momentum (P), Kinetic energy(T), x-component of Kinetic energy (Tx), Potential Energy (V), Total energy(E,H), Hamiltonian operator, Setting up of Hamiltonian Operator for different atoms upto carbon, Eigen function and Eigen value, Mean expectation value, Schrodinger wave equation and particle in a one dimensional box, electron in a ring.

UNIT : II : CHEMICAL BONDING:1

(A) VALENCE BOND THEORY : [8]

Hybridization of orbitals, structure of complexes $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{CoF}_6]^{3-}$, $[\text{MnCl}_4]^{2-}$, $[\text{Ni}(\text{CN})_4]^{2-}$ based on hybridization theory, limitations of VB Theory.

(B) CRYSTAL FIELD THEORY : [7]

Crystal field splitting due to octahedral, tetrahedral, square planar fields created by ligands. Spin free and spin paired conditions. CFSE(crystal field stabilization energy), magnetic properties of complexes. Absorption spectra of complexes, thermodynamic properties due to crystal field like Lattice energy, heat of hydration, ionic radii of M^{2+} , ions of the first transition series, Jahn Teller Effect.

UNIT : III: CHEMICAL BONDING:2

(A) MOLECULAR ORBITAL THEORY: [8]

Basic principles, LCAO, formation of sigma and pi bonding, antibonding, nonbonding molecular orbitals, bond order and its significance, configuration of some heteronuclear molecules and their MO formation- BeH_2 , CH_4 and BH_3 . MO diagrams of complex molecules $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{CoF}_6]^{3-}$, $[\text{Ni}(\text{CN})_6]^{2-}$ and $[\text{Ni}(\text{CO})_4]$.

(B) CHEMISTRY OF f - BLOCK ELEMENTS : [7]

Lanthanide series : Properties of Lanthanides, electron configuration, oxidation states, Color, basic character, solubility of compounds, chemical reactivity, extraction and separation of lanthanides
 Actinides series : Symbol and names of actinides, Transuranic elements, extraction of Thorium, Uranium, Plutonium, their compounds and uses.

UNIT : IV :

(A) NON AQUEOUS SOLVENTS : [5]

Classification, common properties, of ionic solvents, - dielectric constant, dipole moment, viscosity, electrical conductivity, proton affinity, melting and boiling points, Chemical prop of non aq. solvents liq. Ammonia, liq. SO_2 , liq. HF – Acid base reactions, solvated complex formation reactions, solvolytic reaction, precipitation reaction, oxidation reduction reaction, differentiating and leveling solvents.

(B) PHYSICO CHEMICAL PRINCIPLES :**[5]**

Manufacture of Ammonia - Effect of pressure, temperature and catalyst suggested mechanism
 Manufacture of NaOH – Electrolysis of brine, porous diagram process and mercury cathode process

(C) SOLID STATE:**[5]**

Crystal structures, h,k,l notations, Miller's indices, Bragg's equation, X-rays study of NaCl and KCl crystals, X-ray method to determine Avogadro number .

REFERENCE BOOKS:

- 1) Introductory Quantum Chemistry: A K Chandra , 5th Edition, Mc Graw Hill(1998).
- 2) Basic Inorganic Chemistry: F. Allert, Cotton, G. Wilkinson, P.L Gans
3rd Edition, John Willey, New York , 1995.
- 3) Valency and Molecular structures – E. Cartmell and G.W.A Fowels.
3rd Edition ,ELBS ,Bucter worth ,1970.
- 4) A New Concise Inorganic Chemistry , J.D Lee , 4th Edition ,1991 ELBS and
D.van Nostrand company Ltd.
- 5) Principles of Inorganic Chemistry by Puri and Sharma ,29th Edition
- 6) Environmental Chemistry by A.K. Dey.

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PATTERN OF QUESTION PAPER

FOR SEMESTER-END EXAMINATION

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

1. Internal options are compulsory (i.e. Q.1 or Q.1; Q.2 or Q.2 etc. or attempt 2 or 3 out of given four or five)
2. There are four questions (Q. 1 to Q. 4) each carrying 15 marks

The structure for the questions is as under:

Questions	Section	Marks
Question – 1 Unit – I	A (Objective type) (<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	A –do-	5 marks
	B –do-	10 marks

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

KACHCHH UNIVERSITY : BHUJ
SEMESTER : III (THREE)
CHEMISTRY PAPER : IV (wef June 2016)
Paper Code NO. : CECH -304 (ORGANIC CHEMISTRY)

UNIT : I

(A) ACID – BASE PROPERTIES OF ORGANIC SUBSTANCES : [9]

Introduction :Acid – base theory of Arrhenius, of Lowry – Bronsted and of Lewis , Mode of expression of strength of acid and base (pka , pkb values), Acidic character of saturated aliphatic mono and di carboxylic acids, Aromatic acids, Phenols, Basicity of Aliphatic and Aromatic Amines and other compounds like Alcohols, Aldehydes, Ketones, Amides, Imides, Nitro and Cyano compounds. The factors to be covered must include Inductive effect , Resonance, Hybridization, H-Bond and Steric hindrance.

(B) SYNTHETIC DYES : [6]

Introduction, Uses of dyes, Structural features of dyes, Chromophore and Auxochrome, Classifications of fibers and dyes, Mordant and Vat dyes, Acid and Basic dyes, Synthesis of Alizarin, Malachite green , Congored, Eosine and Indigo.

UNIT : II

(A) ELECTROPHILIC AROMATIC SUBSTITUTION : [7]

Disubstitution in Benzene, Determination of orientation, Relative reactivity, Classification of substituents, Mechanism of disubstitution, (Theory of Orientation and reactivity), Orientation in disubstituted benzenes (only guidelines, no mechanism) , Synthetic application and Conversions.

(B) PNAC : (POLYNUCLEAR AROMATIC COMPOUNDS) : [8]

Introduction, Definition, Study of Naphthalene, Anthracene and Phenanthrene , Their aromatic character, Structural features, Synthesis of parent and derivatives by Haworth ring closure method, Chemical properties (Addition, oxidation, Electrophilic substitution with mechanism)

UNIT : III

(A) ALICYCLIC COMPOUNDS : [7]

Introduction, Definition, Structural features, Nomenclature (monocyclic, bicyclic compounds) , Preparation and properties of cyclo alkanes only , Baeyer's strain theory, Heat of combustion, Orbital picture of angle strain and stability of cyclo Propane and cyclo Butane.

(B) CARBOHYDRATES : [8]

Definition, Classification, Nomenclature of parent and derivatives, Reactions with open chain structure of Glucose and Fructose : Oxidation (using Bromine water, Tollens' reagent, Fehling's reagent, HIO₄ and conc. HNO₃), Reduction of Glucose and Fructose , Acetylation of Glucose and Fructose, Epimer and Epimerization, Osazone formation with mechanism and importance, Killiani-Fischer synthesis, Ruff degradation, Open chain structure of Glucose , Cyclic structure of Glucose and conformations

UNIT : IV

(A) AMINO ACIDS : [7]

Definition , structural formula of all 20 α - amino acids, Synthesis of Amino acids (Ammination, Strecker's method, Gabriel's method, Azalactone method), Zwitter ion, Iso electric point, Reaction with Ninhydrin.

(B) PROTEINS :**[8]**

Peptides and proteins, Nomenclature of peptide molecules, Geometry of peptide linkage, Synthesis of di and tri peptides by Bergmann –Zarvas method, Determination of structure of polypeptides / Proteins : Nitrogen terminal method : Use of DNFB, Edman method, Carbon terminal method, Partial hydrolysis, Primary, secondary and tertiary structures of Proteins, Biological importance of proteins.

Reference Books :

- (1) Organic Chemistry : R T Morrison and R N Boyd , 6th or 7th Edition , Prentice Hall, New Delhi
- (2) A Text book of Organic Chemistry : P L SONI, Sultan Chand and sons, New Delhi
- (3) College Organic Chemistry : Singh, Upadhyay, Rao, , Himalaya Publishing house,
- (4) College Organic Chemistry for SYBSc : Singh, Upadhyay, Rao and Lalwani : Himalaya Publishing house
- (5) Name reactions and Mechanism : Rustogi, S K Agarwal
- (6) Organic Chemistry : Cram, Hammond and Hendrickson.
- (7) Basic course in Organic Chemistry : Ramesh Luhana . Maglam Publ. New Delhi.

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KACHCHH UNIVERSITY : BHUJ
SEMESTER : III (THREE) (Paper CECH-303 P)
CHEMISTRY PRACTICALS (wef June 2016)
Marks : External Evaluation : 30 , Internal Evaluation : 20 . Total 50
One exercise from each part to be set for examination .

(A) INORGANIC MIXTURE : (Four radicals) . [20]

(01)	ZnS + (NH ₄) ₂ CO ₃	(02)	ZnS + NiCO ₃	(03)	ZnS + MgCO ₃
(04)	ZnS + MnCO ₃	(05)	ZnCO ₃ + Al ₂ (SO ₄) ₃	(06)	MgCO ₃ + Al ₂ (SO ₄) ₃
(07)	(NH ₄) ₂ CO ₃ + K ₂ SO ₄	(08)	CaCO ₃ + NaHSO ₄	(09)	K ₂ SO ₄ + Na ₂ SO ₄ + (NH ₄) ₂ SO ₄
(10)	KCl + MgCl ₂ + NaCl	(11)	Fe SO ₄ + Al ₂ (SO ₄) ₃ + (NH ₄) ₂ SO ₄	(12)	KCl + SrBr ₂
(13)	KBr + NaBr + NH ₄ Br	(14)	BaCl ₂ + SrBr ₂	(15)	KBr + NH ₄ Cl
(16)	MgCl ₂ + KI	(17)	SrBr ₂ + KI	(18)	(NH ₄) ₂ SO ₄ + MgCl ₂
(19)	Cu SO ₄ + KBr	(20)	Sr CO ₃ + KCl	(21)	Ba CO ₃ + NH ₄ Cl
(22)	CrCl ₃ + (NH ₄) ₂ SO ₄	(23)	K ₂ SO ₄ + K ₂ CO ₃ + KCl	(24)	Pb(NO ₃) ₂ + KNO ₂
(25)	KBr + KCl + KI	(26)	NaNO ₂ + Sr(NO ₃) ₂	(27)	KNO ₂ + NH ₄ NO ₃
(28)	K ₂ CrO ₄ + (NH ₄) ₂ SO ₄	(29)	K ₂ CrO ₄ + NH ₄ Cl	(30)	MnCl ₂ + Zn SO ₄
(31)	NaNO ₃ + KBr	(32)	Sr(NO ₃) ₂ + CaCl ₂	(33)	BaCl ₂ + Sr(NO ₃) ₂
(34)	Ca(NO ₃) ₂ + Mg SO ₄	(35)	NH ₄ Cl + KCl + MgCl ₂	(36)	K ₂ SO ₄ + NH ₄ Br

(B) JOURNAL : [5]

(C) VIVA : [5]

KACHCHH UNIVERSITY : BHUJ
SEMESTER : III (THREE) (Paper CECH-304 P)
CHEMISTRY PRACTICALS (wef June 2016)
Marks : External Evaluation : 30 , Internal Evaluation : 20 . Total 50
One exercise from each part to be set for examination.

(A) ORGANIC SPOTTING : **[10]**

15 substances to be identified and reported in journals.

Acids : Citric acid, Tartaric acid, Phthalic acid, Cinnamic acid, Benzoic acid,
Salicylic acid , Anthranilic acid, p-Nitro benzoic acid.

Phenols : α -Naphthol, β - Naphthol, o-Nitro phenol, p-Nitro phenol

Base : p-Toluidine, Diphenyl amine, o-Nitro aniline, m- Nitro aniline and
p-Nitro aniline

Neutral Liquids : Acetone, Benzaldehyde, Bromobenzene, Chloroform, Ethanol,
Ethyl acetate, CTC, Chlorobenzene, Nitrobenzene

Neutral Solids : Naphthalene, Anthracene, Glucose, Acetanilide, Banzamide.

(B) GRAVIMETRIC ANALYSIS : **[14]**

Pure aq. Solution of the concerned metallic ion is to be given.

(1) Iron as Ferric Oxide . Salt : FeSO_4 **OR** Ferrous Ammonium Sulphate

(2) Ni as Ni(DMG)_2 . Salt : NiCl_2 **OR** NiSO_4

(3) Ba as BaSO_4 . Salt : BaCl_2

(4) Mn as $\text{Mn}_2\text{P}_2\text{O}_7$. Salt : MnCl_2 **OR** MnSO_4

(D) VIVA : **[3]**

Viva will be asked during practical exam and will be related to the practicals.

(E) JOURNALS : **[3]**

Journals should be signed periodically and finely Certified.

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