

# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## PROPOSED SYLLABUS FOR S.Y.B. Sc. SEMESTER-III (EFFECTIVE FROM 2020-21)

### CHEMISTRY PAPER-III [INORGANIC CHEMISTRY]

50 MARKS [EXTERNAL]

TOTAL = 30 HRS.

20 MARKS [INTERNAL]

---

#### UNIT-I

[A] Chemistry of Elements of first transition elements : [5 Hrs.]

Characteristics properties of d-block elements, properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states.

[B] Electronic configuration of atom; L-S coupling: [5 Hrs.]

Introduction, L-S coupling, J-J coupling (introduction), Term symbol, Determination of microstate of  $P^2$ ,  $P^3$  system, Term symbol of C, N, O, Ni,  $Ni^{2+}$ , Fe,  $Fe^{2+}$ ,  $Fe^{3+}$ , Cr,  $Cr^{3+}$ ,  $Co^{2+}$ , V,  $V^{3+}$  and  $Cf$ .

#### UNIT-II

[A] Purification of water [5 Hrs.]

Classification and composition of water ( tap water, mineral water, portable water, distilled water ). Different methods of purification of water for potable and industrial purposes, Soft and hard water. Desalination of sea water by reverse osmosis and electro dialysis.

[B] Paper chromatography : [5 Hrs.]

Principles of chromatography, Classification of chromatography according to mobile phase and stationary phase. Types of paper chromatography, one dimensional, two dimensional and radial paper chromatography,  $R_f$  value, Use of paper chromatography in inorganic analysis (I, IIA, IIIB, IV, and halides).

#### UNIT-III

Quantum Mechanics [10Hrs.]

[A] Derivation of the time independent Schrodinger equation, Wave function and probability function, Well behaved wave function, Particle in one –dimensional box and its importance.

[B] Operators (definition and derivation), Linear operators, Commutator operators, Vector operators, Laplacian operators, Hamiltonian operators, Hermitian operators. Derivation of Hamiltonian equation, Hamiltonian operators for H atom  $H_2^+$ ,  $He^{2+}$  and Li.



### Reference Books:

1. Introductory Quantum Chemistry by A. K. Chandra, Tata Mc. Graw Hill Delhi.
2. Atomic Structure and Chemical Bond by Manos Chandra, Tata Mc. Graw Hill Pub. Co. Ltd.
3. Theoretical Inorganic Chemistry by M. C. Day & J. Selbin Affiliated, East West Pub. Pvt. Ltd.
4. Coordination Compounds (Studies in Modern Chemistry) S. F. A. Kettle, Nelson.
5. Inorganic Chemistry by (Principles of Structure and Reactivity) James E. Huhely, Harper International (NY).
6. Inorganic Chemistry by R. B. Heslop and P. L. Robinson Elsevier Pub. Co. NY.
7. Physical Methods Inorganic Chemistry by R. S. Drago, W.B.S. Saunders Co. London, Reinhold Pub. Co. NY.
8. Basic Concepts of Analytical Chemistry by S. M. Khopkar, Wiley Estern Ltd. New Delhi.
9. Quantitative Analysis Day & Underwood Prentice Hall of India, Pvt. Ltd.
10. Instrumental Method of Analysis B. K. Sharma, Krishna Pub. House, Merrut.
11. Principles of Inorganic Chemistry (Puri, Sharma, Kalia).
12. Enviornmental Chemistry, By S. K. Banerji. Prentice Hall India Pvt. Ltd.
13. Progressive Inorganic Chemistry, Suratkar, Thatte, Pandit, Ideal Book Service, Poona.
14. Advanced Inorganic Chemistry Vol. I & II by Gurudeep Raj, Goel Pub. House, Meerut.
15. Quantum Chemistry Ir. N. Levine, Prentice Hall.
16. Advanced Inorganic Chemistry by Cotton & Wilkinson John Wihn Wiley.
17. Introduction to Chromatography Theory and Practice by V. K. Srivastava and K. K. Srivastava - S. Chand Pub.
18. Environmental Chemistry by. A. K. De.
19. Industrial Chemistry by B. K. Sharma
20. Inorganic chemistry by Gray L. Miessler, Donald A. Tarr, 3<sup>rd</sup> addition, Pearson publication.
21. General and Inorganic chemistry (part-I & II) by R. Sarkar, Books and Allied (P) ltd.



**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

**PROPOSED SYLLABUS FOR S.Y.B.Sc. SEMESTER-III  
(EFFECTIVE FROM 2020-21)**

**CHEMISTRY PAPER-IV [ORGANIC CHEMISTRY]**

**50 MARKS [EXTERNAL]**

**TOTAL = 30 HRS.**

**20 MARKS [INTERNAL]**

---

**UNIT-I**

**[A] Organic Nitrogen compounds: [6Hrs.]**

(i) Preparation and physical properties and chemical reactions of Nitriles, Isonitriles, Carbamates, Semicarbazides and their application in organic synthesis.

(ii) Structure and nomenclature of amines, Preparation of aryl amines, physical properties and chemical reactions. Gabriel-phthalimide reaction, Bromamide reaction.

**[B] Carboxylic acid and its derivatives: [4Hrs.]**

Structure and nomenclature of acid chloride, ester, amides of monocarboxylic acid; Method of formation of monocarboxylic acid derivatives and chemical reactions.

**UNIT-II**

**[A] Heterocyclic compounds: [5Hrs.]**

(i) Classification and nomenclature :

(ii) Synthesis, Chemical properties and reactions of pyridine.

(iii) Skraup's synthesis and Friedlander synthesis of quinoline. Electrophilic substitution reactions, Nucleophilic substitution reactions, Oxidation reaction, Reduction reactions.

(iv) Synthesis, Reactivity and importance of Imidazole and Benzimidazole.

**[B] Polycyclic aromatic Hydrocarbons: [5Hrs.]**

(i) Classification and nomenclature :

(ii) Linear orthofused polycyclic hydrocarbons: Occurrence, synthesis of Tetracene, Pentacene and Hexacene.

(iii) Non-linear orthofused polycyclic hydrocarbons: Occurrence, synthesis of 1,2-benzanthracene, 1,2,5,6-di benzanthracene.

(iv) Ortho-perifused polycyclic hydrocarbons: Occurrence, synthesis of Pyrene, Perylene and Coronene.



## UNIT-III

### [A] Diazonium salts:

[6Hrs.]

- (i) Mechanism of diazotisation and method of preparation of diazonium salts.
- (ii) Nomenclature of diazonium salts.
- (iii) Reactions of diazonium salts., Replacement reactions in which nitrogen atom is eliminated and reactions in which nitrogen atoms are retained

Application of diazonium salts. In the synthesis of aromatic compounds.

- (iv) Laws of coupling , coupling agents, Definition of diazoamino and aminoazo compounds.
- (v) Synthesis and uses of : Methyl orange, Methyl red, congo red and Erichrome Black-T.

### [B] Use of reagents:

[4Hrs.]

Synthesis and applications of following reagents.

- (i) Anhydrous aluminium chloride
- (ii) N-bromo succinimide
- (iii) Selenium dioxide
- (iv) Lithium aluminium hydride.

### Reference books:

1. Organic Chemistry by R.T. Morrison and R.N. Boyd, Prentice Hall India.
2. Organic Chemistry vol-I & II by I.L. Finar.
3. Organic Chemistry vol-I & II by B.K. Sharma, Goel pub. House, Merrut
4. Reaction and reagents In Organic synthesis by O.P. Agrawal Goel pub. House, Merrut.
5. Organic Chemistry by S.H. Pine
6. Reaction Mechanism In Organic chemistry by S.M. Mukharji & S.P. Singh.
7. Organic Chemistry by L.G. Wade Jr. Prentice Hall.



# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## PROPOSED SYLLABUS FOR S.Y.B.Sc. SEMESTER-III (EFFECTIVE FROM 2020-21)

### CHEMISTRY PAPER-V [PHYSICAL CHEMISTRY]

50 MARKS [EXTERNAL]

TOTAL = 30 HRS.

20 MARKS [INTERNAL]

---

#### UNIT-I

##### [A] THEORIES OF REACTION RATE

[4Hrs.]

Derivation of Arrhenius equation. Collision theory of reaction rate, Energy of activation including determination, Effect of catalysis on energy activation.

Numerical problems

##### [B] PHOTOCHEMISTRY

[6Hrs.]

Introduction of photochemistry, Basics of electromagnetic radiations, Photons, Thermal and photochemical laws

- (a) Grothus Draper's law
- (b) Lambert Beer's law
- (c) Einstein's law of photochemical equivalence . Quantum yield or efficiency. Experimental determination of Quantum yields. Reasons of low and high quantum yield. Numerical problems  
Primary and secondary photochemical reactions. Factors affecting quantum yield. (i.e. temperature, light intensity and inert gases).  
Isomeric changes, Polymerisation, Photosensitization, Photo physical process [Fluorescence, Phosphorescence]. Hemilunescence. Factor affecting Fluorescence, Phosphorescence.

#### UNIT-II

##### ELECTROLYTES OR ELECTROCHEMISTRY

[10Hrs.]

Ions in solution, formation of ion in solution metallic conductance, Electrolytic conductance, Electrolysis migration of ions, Transport number of ions and its determination by moving boundary method.

Kohlraush law of ionic conductance. Application of Kohlraush law to

- (a) Determination of degree of dissociation of weak electrolyte.
- (b) Determination of equivalent conductivity of weak electrolyte at infinite dilution
- (c) Determination of solubility and solubility product of sparingly soluble salts.
- (d) Determination of ionic product of water.

Numerical problems





# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## PROPOSED SYLLABUS FOR S.Y.B. SC. SEMESTER-III (EFFECTIVE FROM 2020-21)

### CHEMISTRY PRACTICALS

60 MARKS [EXTERNAL]

UNI. EXAM 2 DAYS

30 MARKS [INTERNAL]

---

#### Gravimetric Estimation of

- |  |   |
|--|---|
| (1) Fe <sup>2+</sup> as Fe <sub>2</sub> O <sub>3</sub> | (Given solution of Fe-NH <sub>4</sub> -SO <sub>4</sub> + H <sub>2</sub> SO <sub>4</sub> ) |
| (2) Ba <sup>2+</sup> as BaSO <sub>4</sub>              | (Given solution of BaCl <sub>2</sub> 2H <sub>2</sub> O + HCl)                             |
| (3) Ni <sup>2+</sup> as Ni (DMG) <sub>2</sub>          | (Given solution of NiCl <sub>2</sub> 6H <sub>2</sub> O + HCl)                             |

#### VOLUMETRIC EXERCISE (Any three)

- (1) To determine the amount of Nickel by EDTA.
- (2) To determine the amount of Copper by EDTA.
- (3) To determine the amount of Zinc by EDTA.
- (4) Determination of total hardness of water by EDTA.

#### ORGANIC SPOTTING [Minimum 8 organic substances]

ACID : Salicylic acid, Cinnamic acid, Phenyl acetic acid, Sulphanilic acid.

PHENOL:  $\alpha$ -Naphthol,  $\beta$ -Naphthol, o-Nitrophenol

BASE: o-Nitroaniline, m-Nitroaniline, p-Nitroaniline, p-Toludine, p-Chloroaniline,

Diphenyl amine, Dimethylaniline, Diethylaniline

NEUTRAL:

ALDEHYDE: Glucose, Benzaldehyde

KETONE: Methyl ethyl ketone, Acetophenone

ESTER: Ethylacetate, Butylacetate

ALCOHOL: Ethanol, Butanol

HYDROCARBON: Anthracene, Naphthalene, Diphenyl

NITRO HYDROCARBON: m-Dinitrobenzene, Nitrobenzene

HALOGENATED HYDROCARBON: Chlorobenzene, Bromobenzene, p-Dichlorobenzene

AMIDE: Benzamide, Thiourea

ANILIDE: Acetanilide



## PHYSICAL PRACTICALS:

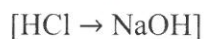
### 1. pH metry:

To determine the normality of weak acid pH-metrically using strong base.



### 2. Conductometric Titration:

To determine the normality of strong acid conductometrically using strong base



### 3. Conductometric Titration:

To determine the solubility of  $\text{PbSO}_4$ .

### 4. Viscosity :

To determine the viscosity of the liquids and the % of unknown mixture 'C'.

### 5. Chemical kinetics-Ester hydrolysis:

To study the hydrolysis of methyl acetate at two different concentration in 0.5N HCl.

[mono molecular reaction ]

### 6. Partition co-efficient

# Minimum 3 experiments should be performed per semester.

# At least one electrical instrumental exercise should be performed per Semester.

