

# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## Syllabus for on 2019

### F. Y. B.Sc. Chemistry; Semester – I

(Paper : 01 : Inorganic & Physical Chemistry)

**Total Hours : 30h**

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#### **UNIT : 01 : SOLID STATE**

**10 h**

Definition of space lattice, Unit cell, Difference between crystalline and amorphous state, types of crystals with illustrations, Law of crystallography. Steno's law and laws of symmetry, lattice planes, Miller indices, Bravais indices, type of cubic system, diagrammatic representation of cubic system and  $d_{100}$ ,  $d_{110}$ ,  $d_{111}$  planes, Bragg's equation (X-ray diffraction), Crystal structure of NaCl, KCl. (Numerical based on Bragg's equation and Miller indices)

#### **Reference Books :**

1. Essentials of physical chemistry by A. S. Bhal and G. D. Tuli, Pub : S. Chand
2. Advance physical chemistry by D. N. Bajpai, Pub : S. Chand
3. Numerical problems by Dogra and Dogra (for numerical)
4. A textbook of physical chemistry by A. S. Negi and S. C. Anand, Pub : New Age International (for numerical)

#### **UNIT : 02**

##### **A. ACID – BASE THEORIES**

**04 h**

Arrhenius theory, Lowry Bronsted theory, Lewis theory, Solvent – Solute concept of acid-base, Soft-Hard acid base and its application.

#### **Reference Books :**

1. Essentials of physical chemistry by A. S. Bahl and G. D. Tuli, Pub : S. Chand

##### **B. Atomic Structure**

**06 h**

Historical perspective of atomic structure; Rutherford's atomic model, Bohr's theory and its limitation, Spectrum of Hydrogen atom (Lyman, Balmer, Paschen, Brackett & Pfund), Quantum numbers, Aufbau, Hund and Pauli exclusion principles, Penetration and shielding, Effective nuclear charge (Slater rule)

#### **Reference Book :**

1. University General Chemistry by C.N.R. Rao, Pub : McMillan
2. Principles of Physical Chemistry by Maron & Pruton, 4<sup>th</sup> edition, Pub: Oxford & IBH
3. Physical Chemistry by G. M. Barrow
4. Advance inorganic chemistry (Vol. II) by Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan; Pub. S. Chand

#### **UNIT : 03 :**

##### **A. CHEMICAL KINETICS**

**06 h**

Chemical kinetics and its scope, rate of reaction, factors affecting rate of reaction : temperature, concentration, pressure, solvent, light and catalyst, Molecularity of reaction, Classification of chemical reaction, Order of reaction with illustration (first order, second

order, third order, zero order, pseudo first order) reaction, : second order (a=b), half life and mean life.

**Reference Books :**

1. Essentials of physical chemistry by A. S. Bahl and G. D. Tuli, Pub : S. Chand
2. Advance physical chemistry by D. N. Bajpai, Pub : S. Chand
3. Numerical problems by D. V. S. Jain, Pub. McGraw Hill (for numerical)

**B. PERIODIC PROPERTIES**

**04 h**

Definition of atomic and ionic radii, ionisation energy, electron affinity and electron negativity, S-Block elements : Comparative study, diagonal relationship, salient features of hydrides.

**Reference Books :**

1. Modern inorganic chemistry by Gurdeep Raj
2. Principals of inorganic chemistry by Puri, Sharma and Kalia; Pub. Vishal publishing
3. Inorganic Chemistry by J. D. Lee

## F. Y. B.Sc. Chemistry Practical syllabus 2019

### Semester- I

#### A) ORGANIC SPOTTING

Primary tests, Ignition test, Detection of Elements, Nature of the substance (solubility test), Functional group tests, C. T., Molecular formula, Structural formula & M. P./ B. P. of the given substance.

ACID – Benzoic, Phthalic acid, Succinic acid.

BASE – Aniline, p – Toluidine

PHENOL – Resorcinol, a Naphthol, b Naphthol

NEUTRAL –

CARBOHYDRATE – Glucose , Fructose

KETONE – Acetone, Acetophenone

ESTER – Methyl salicylate, Methylacetate

ALCOHOL – Methanol , Ethanol

HYDROCARBON – Toluene , Naphthalene

NITRO HYDROCARBON – Nitrobenzene, m-di-nitrobenzene

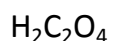
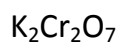
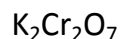
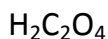
HALOGENATED HYDROCARBON – Carbon tetrachloride, Chlorobenzene,

AMIDE – Urea, Benzamide

ANILIDE – Acetanilide

N. B. Candidate should perform the analysis of at least 08 substances.

#### B) VOLUMETRIC EXERCISE



N. B. Candidate should perform at least 3 volumetric exercises.

# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## Syllabus for on 2019

### F. Y. B.Sc. Chemistry; Semester – II

(Paper : 01 : Inorganic & Physical Chemistry)

**Total Hours : 30h**

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#### **UNIT : 01**

##### **A. CONDUCTANCE AND IONIC EQUILIBRIUM**

**06 h**

Electrical conductance, Specific conductance, equivalent conductance, Molar conductance, Effect of dilution on concentration, Cell constant, Determination of Cell constant, Ostwald's dilution law and its limitations, **Acid & Basic buffer actions (Henderson-Hasselbach equation), Buffer capacity**, Numerical.

##### **B. THERMODYNAMICS**

**04 h**

Second law of thermodynamics (in detail), Carnot cycle and its efficiency, Entropy concept, Change of entropy for reversible isothermic, isobaric, isochoric and **adiabatic** processes. Entropy change for ideal gases (**T & V as variables, P & T as variables**), Numerical.

#### **Reference Book :**

1. Physical Chemistry by ArunBahl, B. S. Bahl and G. D. Tuli; Pub. S. Chand
2. Advance physical chemistry by D. N. Bajpai; Pub : S. Chand
3. Text book of physical chemistry by P. L. Soni, O. P. Dharma; Pub. S. Chand

#### **UNIT : 02 :**

**04 h**

##### **A. BASIC PRINCIPLES OF QUALITATIVE ANALYSIS**

[I] **Dry Reaction** : theory behind borax bead test with equation, Flame test (Theory, structure of non luminous Bunsen flame)

[II] **Analysis of Cation** : Application of common ion effect, solubility product constant. Complexometric reactions involved in qualitative analysis;

1. For identification [reaction between Cu(II) ion with ammonia, Fe(III) with thiocyanide,  $\text{NH}_4^+$  with Nessler Reagent].
2. For masking [ $\text{Cd}^{+2}$ ,  $\text{Cu}^{+2}$ ].
3. Separation of two ions [ $\text{Ag-Hg}$ ,  $\text{Zn}^{+2}$ ,  $\text{Mn}^{+2}$ ]

#### **Reference Books :**

1. Qualitative analysis by R. A. Day and A. L. Underwood
2. Vogel's qualitative Inorganic analysis

##### **B. Coordination Chemistry**

**06 h**

Shape of d-orbitals, CFT – Basic assumption, splitting of d-orbitals in Octahedral, Tetrahedral, Square planer complexes, distribution of  $d^x$  electrons in Octahedral and Tertahedral complexes and CFSE.

#### **Reference Book :**

1. Inorganic chemistry by Wahid Malik, G. D. Tuli, R. D. Madan; Pub. S. Chand
2. Coordination Chemistry by GurdipChatwal, M. S. Yadav; Pub. Himalaya pub. house

3. Advance inorganic chemistry (Vol. II) by Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan; Pub. S. Chand

**UNIT : 03 :**

**[A] CHEMICAL BONDING**

**05 h**

Definition of chemical bonds (covalent, co-ordinate covalent, ionic, metallic, H-bond, Van der Waals forces of attraction), Polarisability (Fajan's rule), Molecular Orbital theory ; LCAO method, Bonding molecular orbital, non-bonding molecular orbital, anti-bonding molecular orbital, bond order, magnetic properties and molecular orbital energy level diagram of hetero diatomic molecule : CO and NO, VSEPR theory.

**Reference Book :**

1. Concise Inorganic Chemistry (5<sup>th</sup> ed.) by J. D. Lee
2. Basic Inorganic Chemistry by Cotton & Wilkinson.
3. Inorganic Chemistry – Principles of structure and reactivity by J. E. Huheey, E. A. Keiter; Pub. Person Education Publishers.

**[B] PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTION**

**05 h**

Classification of physical properties (additive, constitutive, colligative, additive-constitutive), Atomic volume, Molar volume and Chemical constitution, Kopp's law, Surface tension, Drop number method, Parachor, Viscosity, Determination of viscosity by Ostwald viscometer, Define : Refraction, Specific refraction, molar refraction, Numerical.

**Reference Book :**

1. Principles of Physical chemistry by Puri, Sharma and Madan; Pub. Vishal publishing
2. Essentials of physical chemistry by A. S. Bhal and G. D. Tuli, Pub : S. Chand
3. Advance physical chemistry by D. N. Bajpai, Pub : S. Chand

## F. Y. B.Sc. Chemistry Practical syllabus 2019 Semester-II

### A. INORGANIC QUALITATIVE ANALYSIS

#### LIST OF INORGANIC CHEMICALS

CHLORIDES :  $\text{Cu}^{+2}$ ,  $\text{Fe}^{+3}$ ,  $\text{Mn}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ .

BROMIDES :  $\text{Sr}^{+2}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ .

IODIDE :  $\text{K}^+$

NITRATE :  $\text{Pb}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ .

SULPHIDE :  $\text{Zn}^{+2}$ ,  $\text{Sb}^{+3}$ .

SULPHATE :  $\text{Cu}^{+2}$ ,  $\text{Al}^{+3}$ ,  $\text{Fe}^{+2}$ ,  $\text{Zn}^{+2}$ ,  $\text{Mn}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ .

CHROMATE :  $\text{Na}^+$ ,  $\text{K}^+$

CARBONATE :  $\text{Cu}^{+2}$ ,  $\text{Zn}^{+2}$ ,  $\text{Mn}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$

PHOSPHATE :  $\text{Cu}^{+2}$ ,  $\text{Al}^{+3}$ ,  $\text{Fe}^{+3}$ ,  $\text{Zn}^{+2}$ ,  $\text{Mn}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$

OXIDE :  $\text{Sb}^{+3}$ ,  $\text{Zn}^{+2}$

**N. B. Candidate should perform the analysis of at least 8 compounds.**

### B. PREPARATIO OF STANDARD SOLUTION (BY STUDENTS) OF FOLLOWING.

1. 0.1 N succinic acid against NaOH
2. 0.1 N KHP against NaOH/KOH
3. 0.01 N  $\text{Na}_2\text{S}_2\text{O}_3$  against  $\text{I}_2$  solution
4. 0.1 N  $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$  against  $\text{KMnO}_4$  solution
5. 0.1 N  $\text{K}_2\text{Cr}_2\text{O}_7$  against  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  Or  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  solution

**N. B. Candidate should perform at least 3 volumetric exercises.**

VEER NARMAD SOTH GUJARAT UNIVERSITY, SURAT

Syllabus on 2019

For

F. Y. B. Sc. Semester- I

Paper-II

(Organic Chemistry)

**UNIT I:(A) Alkanes and Cycloalkanes: 10 Hrs.**

Alkanes : IUPAC nomenclature of branched and unbranched alkanes, Alkyl group, Classification of carbon atoms in alkanes. Isomerism in Alkanes, sources, methods of formation special reference to **Wurtz reaction, Kolbe reaction and Corey-House reaction and decarboxylation of carboxylic acids**). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenations of alkanes: orientation, reactivity & selectivity.

**(B) Cycloalkanes :** Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (Cyclo propane and cyclo butane), Theory of strainless ring. The case of cyclo propane ring: banana bonds

**UNIT II : Stereochemistry 10 Hrs.**

- (a) Isomerism :- Optical activity , Chiral and Achiral molecules,
- (b) Optical isomerism of tartaric acid, Enantiomers, diastereomers( Threo&Erythro), Meso compounds Resolution of Racemates, inversion retention and racemization .
- (c) Geometrical Isomerism: Alkene derivative & oximes E & Z system of nomenclature.
- (d) Relative and absolute configuration, sequence rules. D & L and R & S system of nomenclature.

**UNIT III (A) Heterocyclic compounds : 5 Hrs.**

Nomenclature aromaticity , and synthesis properties uses and canonical structures of Pyrrol, Benzopyrol Furan , Benzofuran, Thiophene, Benzothiophene.

**(B) PolynuclearHydrocarbons : 3 Hrs.**

Classification aromaticity and Industrial preparation, , properties, uses and canonical structures of Napthalene , Anthracene and Phenanthrene.

**(C) Organic Qualitative Analysis 2 Hrs.**

**(I) Elemental Analysis (Lassaign's Test with equation)**

**(II) Solubility of Organic Compound (Ref. : Vogel's qualitative organic analysis)**

Chemical Methods : Solubility in  $\text{NaHCO}_3$ ,  $\text{NaOH}$  and  $\text{HCl}$  , Acid, Base and Phenol and amphoteric compounds ( Sulphanilic acid and Anthranilic acid )

Syllabus on 2019

For

**F. Y. B. Sc. Semester- II**

Paper-II

(Organic Chemistry)

**UNIT: I: Reaction mechanism :10 Hrs.**

- (a) Homolytic and Heterolytic fission free radicals carbonium ions ( carbocations ) and carbanions reactive intermediates carbenes , arynes and nitrenes.
- (b) Types of reagents, electrophiles nucleophiles .
- (c) Eletromeric, inductive, conjugative effect.
- (d) Types of reactions : Addition, substitution, elimination, rearrangments. Addition, and Substitution with respect to electrophilic and nucleophilic reaction,  $SN^1$  &  $SN^2$
- (e) Mechanism of (i) addition reaction to alkenes and dienes (ii) substitution in benzene Ring, nitration ,sulfonation, alkylation , acylation, halogenation., cyanohydrin formation andacetal formation,
- (f) Mechanism of Perkin reaction, Benzoin Condensation andCannizaro's reaction

**UNIT II: (A) Empirical formula, Molecular formula, and Structural formula: 4 Hrs.**

Determination of empirical formula and its relation with molecular formula  
determination of molecular weight of (a) Organic acid by Silver salt method and  
(b) organic base by chloroplatinate method and its limitations .  
Numerical example.

**(B) Carbohydrates:**

**6 Hrs.**

Modern definition of carbohydrates, classification of carbohydrates, function of Carbohydrates, optical isomers, Diastereoisomers, enantiomers racimates of Glucose and Fructose, Structure of Glucose and Fructose isomers, mutarotation, glucoside linkage (Pyranose and Furanose) D & L isomers of Glucose and Fructose, derivatives of Monosaccharide, step up and stepdown synthesis, kilyani synthesis, conversion of glucose to Fructose and conversion of Fructose to glucose.

**UNIT – III (A) Alkenes, dienes and alkynes : 10Hrs.**

- (a) Alkenes : Nomenclature, method of preparation, properties and uses of ethylene and propylene Morkwonikoffs rule and Satytzeff rule, polymerization of ethylene styrene and vinyl chloride. Alkenes. Reactions: Hydroboration, Oxidation, Epoxidation, Ozonolysis, Oxymercuration, Hydroxylation, Hydrohalogenation, Dehydrohalogenations, Hydration.
- (b) Dienes : Nomenclature, classification of dienes methods of formation of Butadiene chemical reactions 1,2 and 1,4 additions, Diel's – Alder reaction.
- (c) Alkynes : Nomenclature , methods of formation, chemical reactions: Hydroboration, Oxidation, metal ammonia reduction, oxidation, polymerization. Electrophilic and nucleophilic addition reactions of acetylene.



## **Reference Books**

- (1) Organic chemistry vol.I and vol. II by I.L.Finar (Longman group)
- (2) Organic chemistry by P.L.Soni
- (3) Organic chemistry by R.T.Morrison and Boyd Prentice Hall India.
- (4) Organic chemistry by B.K. Sharma.
- (5) Organic chemistry by Bahland Bahl
- (6) Organic reaction mechanism by Mukharji and singh
- (7) Fundamentals of Organic chemistry by Soloman, John Wiely