

# Solapur University, Solapur.

## Semester Pattern Syllabus For B. Sc. PART- I (Chemistry) In force from June, 2010

### General Structure:

A) **Theory:** There will be two theory papers of 50 marks for each semester.

### Semester-I

Theory paper will have two Papers their titles & distribution of marks will be as under.

#### Chemistry Paper - I (Physical Chemistry). -- 50 Marks

		Periods
1) Chemical Kinetics	-	17
2) Mathematical Concepts	-	06
3) Thermodynamics	-	05
4) Gaseous State	-	09

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Total - 37 Periods

#### Chemistry Paper – II (Inorganic Chemistry). -- 50 Marks

		Periods
1) Covalent bonding	-	13
2) Ionic Solids	-	08
3) Metallurgy	-	09
4) Atomic Structure and Periodic Properties	-	08

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Total - 38 Periods

### Semester-II

#### Chemistry Paper - III ( Organic Chemistry). -- 50 Marks

		Periods
1) Fundamentals of Organic reaction mechanism	-	06
2) Stereo Chemistry of Organic compound	-	06
3) Alkanes and Cycloalkanes	-	04
4) Alkanes, Dienes and Alkynes	-	08
5) Aromaticity of benzenes	-	06
* 6) Structure & bonding	-	07

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Total - 37 Periods

#### Chemistry Paper-IV (Analytical Chemistry) -- 50 Marks

		Periods
1) Physical properties of liquids	-	08
2) Distribution Law	-	06
3) Errors in analysis	-	04
4) Environmental Chemistry	-	04
5) Qualitative and Quantitative elemental analysis	-	08
6) Chemistry in day to day life	-	08

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Total – 38 Periods

**Total Periods for Sem. I & II = 150**

## B.Sc. Part- I Chemistry Syllabus

- N.B. (i) Figures shown in bracket indicate the total number of lectures required for the respective topics.**
- (ii) The question paper should cover the entire syllabus. Marks allotted to questions should be in proportion to the number of lectures allotted to respective topics.**
- (iii) All topics should be dealt with S.I. units.**
- (iv) Industrial tour is prescribed.**
- (v) Use of scientific calculator is allowed.**

### Semester – I

#### Chemistry Paper- I (Physical Chemistry)

**50 Marks**

#### 1. Chemical Kinetics

**(17)**

- 1.1 Chemical Kinetics and it's scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst.
- 1.2 Order and Molecularity of reaction, Zero order reaction and its example :Photochemical union of H<sub>2</sub> and Cl<sub>2</sub>
- 1.3 First order reaction: Derivation of Rate constant. Characteristics of first order reaction. Examples: i) Decomposition of oxalic acid & ii) Decomposition of N<sub>2</sub>O<sub>5</sub>
- 1.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction. Examples : i) Reaction between K<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and KI & ii) Saponification of ethyl acetate.
- 1.5 Pseudounimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid & decomposition of H<sub>2</sub>O<sub>2</sub> (KMnO<sub>4</sub> method).
- 1.6 Methods to determine the order of reaction:
- a) Integration method
  - b) Graphical method
  - c) Half change method
  - d) Ostwald's isolation method
  - e) van't Hoff differential method
- (Numerical Problems Expected)

#### 2. Mathematical Concepts

**(06)**

- 2.1 Graphical representation : Graph paper, co-ordinates of a point, equation of straight line and intercept, plotting of graph based on experimental data.

2.2 Derivative : Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.

2.3 Integration : Rules of Integration (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.  
(Numerical Problems not expected)

**3. Thermodynamics :** (05)

3.1 Spontaneous & non spontaneous processes, Second law of thermodynamics and its different statements.

3.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency.  
(Numerical Problems Expected)

**4. Gaseous State :** (09)

4.1 a) Ideal and Non ideal gases

b) Deviation from ideal behaviour. (Only Boyle's law)

c) Causes of deviation, van der Waal's equation, explanation of real gas behaviour by van der Waal's equation.

4.2 Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants.

4.3 Liquification of gases, Joule-Thomson effect.  
(Numerical Problems expected)

**Reference Books :**

- 1) Mathematical preparation of Physical Chemistry : F. Daniel Mc-Graw Hill Book Com.
- 2) Elements of Physical Chemistry : S. Glasstone and D.Lewis (D.Van Nostrand Co.Inc)
- 3) Physical Chemistry : W. J. Moore (Orient Longman)
- 4) Principles of Physical Chemistry : Maron Prutton
- 5) University Chemistry : B. H. Mahan (Addision - Weseley Publ. Co.)
- 6) Chemistry Principle & Applications : P.W. Atkins, M. J. Clugsto,  
M.J. Fiazer, R. A. Y. Jone (Longman)
- 7) Physical Chemistry : G. M. Barrow (Tata Mc-Graw Hill)
- 8) Essentials of Physical Chemistry : B. S. Bahl & G.D. Tuli (S. Chand)
- 9) Physical Chemistry : A. J. Mee.
- 10) Physical Chemistry : Daniels - Alberty.
- 11) Principles of Physical Chemistry : Puri - Sharma (S. Nagin)
- 12) Text Book of Physical Chemistry : Soni Dharmarha
- 13) University General Chemistry : CNR. Rao (McMillan)

- 14) Chemistry : Sienko - Plane ( Recent Edn.,)
- 15) Physical Chemistry Through problems : Dogra and Dogra (Wiley Eastern Ltd.,)
- 16) Physical Chemistry : S. Glasstone.
- 17) Basic Chemical Thermodynamics : V. V. Rao.

**Chemistry Paper-II (Inorganic Chemistry)****50 Marks****1. Covalent Bonding (13)**1.1 Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t.  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{ClF}_3$ 

1.2 Molecular Orbital Theory.

- (a) Atomic and Molecular orbitals.
- (b) L.C.A.O. Principle
- (c) Bonding, Antibonding and Nonbonding Molecular orbitals.
- (d) Conditions for successful overlap
- (e) Different types of overlap.
  - s-s, s-p<sub>x</sub>, p<sub>x</sub> - p<sub>x</sub> and p<sub>y</sub>- p<sub>y</sub> or p<sub>z</sub>- p<sub>z</sub>
- (f) Energy level sequence of molecular orbitals for n = 1 and n = 2
- (g) M. O. Diagrams for -
  - i) Homonuclear diatomic molecule.  $\text{H}_2$ ,  $\text{Li}_2$ ,  $\text{Be}_2$ ,  $\text{C}_2$ ,  $\text{N}_2$  and  $\text{O}_2$
  - ii) Heteronuclear diatomic molecules  $\text{CO}$  and  $\text{NO}$  w.r.t. bond order stability and magnetic properties.

**2. Ionic Solids (08)**

2.1 Ionic Bonding

- (a) Formation of ionic bond, Energetics of ionic bonding : Ionisation potential, Electron affinity and Lattice energy.
- (b) Characteristics of ionic compounds.
- (c) Born-Haber Cycle for Alkali metal halide ( $\text{NaCl}$ ). (Numerical Problems are expected)
- (d) Fajan's rules.

2.2 Radius ratio and crystal structure.

- (a) Definition : Radius ratio  $\left(\frac{r^+}{r^-}\right)$  , Coordination number, Stoichiometry and unit cell.
- (b) Concept and calculation of radius ratio  $\left(\frac{r^+}{r^-}\right)$  for ionic solid with octahedral geometry.
- (c) Radius ratio effect on geometry.
- (d) Crystal structure of  $\text{NaCl}$  and  $\text{CsCl}$  w.r.t. unit cell, radius ratio, coordination number and stoichiometry.

**3. Metallurgy (09)**

3.1 Introduction :- Terms used in Metallurgy, Metallurgy, Mineral, Ore, Gangue, Flux, Slag

3.2 Occurrence of metals : Types of Ores.

### 3.3 Steps Involved in Metallurgical Processes :

#### A) Concentration of Ores

- i) Physical Methods :- a) Gravity separation method b) Magnetic separation method c) Froth floatation method.
- ii) Chemical Methods : a) Calcination b) Roasting

B) Reduction : Mention various methods of reduction. Extraction of Iron by blast furnace.

C) Refining or purification : Mention various methods of refining, Electrorefining in detail e.g. Zinc.

### **4. Atomic Structure and periodic properties (08)**

#### 4.1 Atomic Structure

- a) Shapes of s, p, d orbitals.
- b) Aufbau and Pauli's exclusion principle, Hund's rule of maximum multiplicity
- c) General electronic configuration of s and p block elements.

4.2 General Characteristics of s and p block elements w.r.t. Atomic and Ionic radii, Ionisation energy, Electron affinity Electronegativity, Reactivity, Melting and Boiling point.

#### **Reference Books :**

- 1) Advanced Inorganic Chemistry - Cotton and Wilkinson
- 2) Inorganic Chemistry - J. E. Huheey
- 3) Concepts and models of Inorganic Chemistry - Douglas & Mc-Daniel
- 4) Principles of Inorganic Chemistry - Puri, Sharma
- 5) New Consise Inorganic Chemistry - (ELBS) - J. D. Lee
- 6) Text book of Inorganic Chemistry - P. L. Soni
- 7) Advanced Inorganic Chemistry - Satyaprakash, Tuli, Basu
- 8) Theoretical Principles of Inorganic Chemistry - G. S. Manku
- 9) Principles of Inorganic Chemistry - Puri, Sharma & Kalia
- 10) Vogel's Text book of Quantitative Inorganic Analysis 4<sup>th</sup> Edition.
- 11) Instrumental Methods of Chemical Analysis 5<sup>th</sup> Edition (Analytical Chemistry) - Chatwal, Anand.
- 12) Chemistry - Central Science, Brown, Lemay, Bursten 8<sup>th</sup> Edition.
- 13) Principles of Soil Science - M. M. Raj, Millian Co. of India, Bombay 1977
- 14) Environmental pollution analysis - S.M. Khopkar
- 15) Industrial Chemistry - Rogers
- 16) Industrial Chemistry - R. K. Das

## Semester – II

## Chemistry Paper-III (Organic Chemistry)

50 Marks

**1. Fundamental of organic reaction mechanism (06)**

- 1.1 Meaning of reaction mechanism.
- 1.2 Curved arrow notation, Half headed and double headed arrows.
- 1.3 Types of bond breaking : Homolytic and Heterolytic.
- 1.4 Types of reagents : Electrophilic and Nucleophilic.
- 1.5 Types and sub-types of following organic reactions with definition and at least one example of each.

a) Substitution b) Addition c) Elimination d) Rearrangement.

(Mechanism is not expected)

- 1.6 Reactive Intermediates with examples carbocations, carbanions (formation, structure, stability and reactions are expected). Carbon free radicals, carbenes, arenes, nitrenes (Definition with example only)

**2. Stereo chemistry of organic compounds (06)**

- 2.1 Types of stereo-isomerism - Optical isomerism, Geometrical isomerism and Conformational isomerism.
- 2.2 Optical isomerism : plane polarised light and asymmetric carbon atom, optical activity.
- 2.3 Elements of symmetry
- 2.4 Chiral centre [ Explanation with lactic acid]
- 2.5 Conditions for optical activity - Explanation with lactic acid. 2-butanol and mesotartaric acid.
- 2.6 Optical isomerism in lactic acid, tartaric acid and 2,3 - dihydroxy butanic acid
- 2.7 Enantiomers and diastereoisomers.
- 2.8 Racemic modification.
- 2.9 Geometrical isomerism-cause of geometrical isomerism.
- 2.10 Geometrical isomerism w.r.t.  $\begin{array}{c} \diagup \\ \text{C} \\ \diagdown \end{array} = \begin{array}{c} \diagdown \\ \text{C} \\ \diagup \end{array}$   
Geometrical isomerism in maleic acid and fumaric acid.

**3. Alkanes and Cycloalkanes (04)**

- 3.1 Alkanes : - Methods of formation with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acid.
- 3.2 Mechanism of free radical halogenation of alkanes.
- 3.3 Cycloalkanes - Nomenclature methods of formation (a) Internal Wurtz reaction

(b) Distillation of calcium or barium salt of dicarboxylic acid.

3.4 Chemical properties of cyclopropane (i) Free radical substitution of chlorine in presence of light. (ii) Action of HBr and conc.  $\text{H}_2\text{SO}_4$  (iii) Catalytic reduction by  $\text{H}_2/\text{Ni}$

#### **4. Alkenes, Dienes and Alkynes (08)**

4.1 Nomenclature of alkenes.

4.2 Methods of formation of alkenes with mechanism

i) By dehydration of lower alcohols.

ii) By dehydrohalogenation of lower alkyl halides.

4.3 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation, Oxidation with  $\text{KMnO}_4$ , Polymerisation of alkenes - ethylene and propylene

4.4 Nomenclature and classification of dienes.

4.5 Isolated, Conjugated and cumulated dienes.

4.6 Butadiene - Methods of formation, polymerisation, 1 : 2 & 1 : 4 additions and Diels-Alder reaction.

4.7 Alkynes - Nomenclature, Acidity of alkynes.

4.8 Electrophilic and Nucleophilic addition reactions, Hydroboration, Oxidation, Metal - Ammonia reductions, Oxidation and polymerisation.

#### **5. Aromaticity and Benzene (06)**

5.1 Meaning of the terms - Aromatic, non-aromatic, antiaromatic and pseudoaromatic compounds.

5.2 a) Kekule structure of benzene

b) Resonance structures of benzene.

c) Molecular orbital picture of benzene.

d) Representation of benzene ring.

5.3 Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons, coplanarity and Huckel's  $(4n + 2) \pi$  rule. Applications of Huckel's rule to naphthalene, anthracene, pyrrole, furan, thiophene and pyridine.

5.4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenation and Friedel - Craft's reaction- alkylation and acylation.

#### **6. Structure and Bonding (07)**

6.1 Hybridisation :  $\text{sp}^3$ ,  $\text{sp}^2$  and  $\text{sp}$  w.r.t. methane, ethylene and acetylene respectively.

6.2 Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. :  $\text{sp}^3$ ,  $\text{sp}^2$  and  $\text{sp}$  hybridisation



6.3 Localised and delocalised chemical bonds.

6.4 Resonance effect with respect to phenol, aniline and nitrobenzene.

6.5 Hyperconjugation w.r.t. toluene.

6.6 Inductive effect w.r.t. formic acid, acetic acid, benzoic acid mono, di and trichloroacetic acid.

6.7 Steric effect w.r.t. mesitoic acid.

### **Reference books**

- 1) Organic Chemistry : Hendrickson, Cram, Hammond.
- 2) Organic Chemistry : Morrison & Boyd
- 3) Organic Chemistry : Volume I & II I.L. Finar
- 4) Organic Chemistry : Pine
- 5) Advanced Organic Chemistry : Sachinkumar Ghosh
- 6) Advanced Organic Chemistry : B.S. Bahl and Arun Bahl
- 7) A Guide book to Mechanism in organic Chemistry : Peter Sykes
- 8) Stereochemistry of Organic Chemistry : Kalsi,
- 9) Stereochemistry of Carbon Compounds : Eliel
- 10) Text book of Organic Chemistry : P. L. Sony
- 11) Practical Organic Chemistry : By A. I. Vogel
- 12) Advanced Organic Chemistry - Reactions, Mechanism & Structure : Jerry March
- 13) Organic Chemistry : M.R. Jain
- 14) Organic Chemistry : J. M. Shaigel

**Chemistry Paper-IV (Analytical Chemistry)****50 Marks****1. Physical properties of liquids (08)**

- 1.1 Introduction, additive & constitutive properties.
- 1.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer.
- 1.3 Surface tension:- Determination of surface tension by Drop –Weight method
- 1.4 Parachor:-Macleod equation & its modification by Sugden, applications of parachor in the determination of molecular structures as benzene, quinone, NO<sub>2</sub> group & PCl<sub>5</sub> (Numerical problems not expected).

**2. Distribution Law (06)**

- 2.1 Nernst distribution law, Its limitations & modification with reference to association & dissociation of solute in one of the solvent.
- 2.2 Applications of distribution law in:
  - a) Process of extraction ( derivation expected)
  - b) Determination of solubility
  - c) Distribution Indicators
  - d) Determination of molecular weight(Numerical problems expected)

**3. Errors in Analysis (04)**

- 3.1 Limitations of Analytical methods.
- 3.2 Accuracy.
- 3.3 Precision
- 3.4 Classification of Errors.
- 3.5 Minimization of Errors
- 3.6 Mean (Average) deviation and standard deviation

**4. Environmental Chemistry (04)**

- 4.1 Introduction : Meaning of terms : Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD)
- 4.2 Types of Pollution (Only brief Introduction) :  
Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution.

4.3 Air Pollution : Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.

**5. Qualitative and Quantitative elemental analysis (08)**

5.1 Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur

5.2 Quantitative analysis of -

i) Carbon & hydrogen by Combustion method

ii) Nitrogen by Kjeldahl's method

iii) Halogen and sulphur by Carius method.

5.3 Determination of molecular weight of an acid by titration method & baseplatinichloride method.

5.4 Empirical formula and molecular formula determination.

(Numerical Problems Expected)

**6. Chemistry in day to day life (08)**

6.1 Types of water, desalination, Fresh water, Dissolved Oxygen and water quality.

6.2 Milk : Definition, Chemical composition of milk of different species such as cow, buffalo and goat.

6.3 Adulteration in milk like Sugar, Urea, Starch.

6.4 Essential nutrients for plants, Classification, Major, minor & trace their sources and forms.

6.5 Importance of Inorganic Compounds as Medicine- Antacid products  $\text{Na}_2\text{CO}_3$ ,  $\text{Al}(\text{OH})_3$ ,  $\text{AlPO}_4$ ,  $\text{Mg}(\text{OH})_2$ , Cis -platin

**Reference Books**

- 1) Chemistry - Central Science, Brown, Lemay, Bursten 8<sup>th</sup> Edition.
- 2) Outline of Dairy Technology - Sukumar De Oxford university Press.
- 3) Introduction to Agronomy & soil water management - V. G. Vaidya, N.R. Sahastrabudhye.
- 4) Principles of Soil Science - M. M. Raj, Millian Co. of India, Bombay 1977
- 5) Inorganic Medicinal & Pharmaceutical Chemistry- Block, Roche, Soine – Wilson, Varghese Publishing House.
- 6) Environmental Chemistry - A.K. De
- 7) Environmental pollution analysis - S.M. Khopkar
- 8) Organic Chemistry : Hendrickson, Cram, Hammond.
- 9) Organic Chemistry : Morrison & Boyd
- 10) Organic Chemistry : Volume I & II I.L. Finar

- 11) Organic Chemistry : Pine
- 12) Advanced Organic Chemistry : Sachinkumar Ghosh
- 13) Advanced Organic Chemistry : B.S. Bahl and Arun Bahl
- 14) A Guide book to Mechanism in organic Chemistry : Peter Sykes
- 15) Stereochemistry of Organic Chemistry : Kalsi,
- 16) Stereochemistry of Carbon Compounds : Eliel
- 17) Text book of Organic Chemistry : P. L. Sony
- 18) Practical Organic Chemistry : By A. I. Vogel
- 19) Advanced Organic Chemistry - Reactions, Mechanism & Structure : Jerry March
- 20) Organic Chemistry : M.R. Jain
- 21) Organic Chemistry : J. M. Shaigel

## Laboratory Course (Practicals)

**N.B.** i) Use of Digital balance is allowed.

ii) Use S.I. Units Wherever Necessary.

### Physical Chemistry.

- 1) Determination of viscosity of given liquids A and B. (Density data of liquids, viscosity of water to be given.) [Any two liquids from, Acetone,  $\text{CCl}_4$ , Ethyl alcohol, Ethylene glycol and n-propyl alcohol]
- 2) Determination of equivalent wt of Mg. by Eudiometer.
- 3) Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl,
- 4) Study of specific reaction rate of hydrolysis of methyl acetate in presence of  $\text{H}_2\text{SO}_4$
- 5) Study of reaction between  $\text{K}_2\text{S}_2\text{O}_8$  and KI (Equal Concentrations)
- 6) Determination of heat of ionisation of weak acid.

### Reference Books :

- 1) Practical book of Physical Chemistry : Nadkarni, Kothari & Lawande.
- 2) Experimental Physical Chemistry : A. Findlay.
- 3) Systematic Experimental Physical Chemistry : S.W. Rajbhoj, Chondhekar (Anjali Pub.)
- 4) Experiments in Physical Chemistry : R.C.Das and B. Behra. (Tata Mc. Graw Hill)
- 5) Advanced Practical Physical Chemistry : J. B. Yadav (Goel Publishing House)
- 6) Practical Physical Chemistry : B. D. Khosala ( R. Chand & Sons.)
- 7) Experiments in Chemistry : D. V. Jagirdar

### Organic Chemistry

#### 1) Estimations :

- i) Estimation of aniline                                  ii) Estimation of acetamide

#### 2) Organic Qualitative Analysis.

Identification of at least five organic compounds with reactions including one from acids, one from phenols, one from bases and two from neutrals from the list of the compounds given below -

- i) Acids : Oxalic acid, Benzoic acid and Cinnamic acid
- ii) Phenols :  $\beta$  - Naphthol, Resorcinol.
- iii) Bases : Aniline, p - toluidine.
- iv) Neutrals : Acetone, Ethyl acetate, Glucose, Chloroform, Chlorobenzene, m-dinitrobenzene, Thiourea.

**Note :** A systematic study of an organic compound involves the following operations which should be taught in details with reactions in the detection of elements and functional group.

- 1) Preliminary tests and physical examination.
- 2) Determination of physical constant.
- 3) Detection of Elements.
- 4) Determination of functional group.
- 5) A search into the literature.
- 6) Special Test.
- 7) Summary.
- 8) Result.

### 3) Organic Preparation : (Any one)

- i) Preparation of benzoic acid from benzamide.
- ii) Preparation of p-nitroacetanilide from acetanilide  
(Calculation of Theoretical yield, wt. of crude product, recrystallisation of the crude product are expected)  
M.P. of the recrystallised product is not expected.

### Reference Books :

- 1) Vogel's Text Book of Quantitative Chemical Analysis, (Longman) ELBS. Edition
- 2) Vogel's Text Book of Qualitative Chemical Analysis, (Longman) ELBS. Edition
- 3) Hand book of Organic Qualitative Analysis : Clarke
- 4) Comprehensive Practical Organic Chemistry - Quantitative Analysis by V.K. Ahluwalia, Sunita Dhingra, University Press. Distributor - Orient Longman Ltd.,
- 5) Comprehensive Practical Organic Chemistry preparation and Quantitative Analysis. : V.K. Ahluwalia, Renu Agarwal, University Press. Distributor - Orient Longman Ltd.,
- 6) A laboratory Hand-Book of organic Qualitative Analysis and separation :V. S. Kulkarni, Dastane Ramchandra and Co. Pune

## Inorganic Chemistry

### A) Inorganic Quantitative Analysis :

- 1) Study of analytical balance and calibration of fractional weights.
- 2) Volumetric Analysis :
  - 2.1 To prepare a standard solution of Oxalic acid and determine the strength of Sodium Hydroxide solution in terms of normality and  $\text{Kg/dm}^3$
  - 2.2 To prepare a standard solution of Oxalic acid and determine the strength of Potassium permanganate solution in terms of normality and  $\text{Kg/dm}^3$
  - 2.3 To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality

and  $\text{Kg/dm}^3$  (Use internal indicator)

**B) Qualitative Analysis :**

1) Spot Tests :

Detection of following cations using spot tests :  $\text{Cu}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Zn}^{2+}$ ,  
 $\text{Mg}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Pb}^{2+}$ .

2) Chromatography :

Separation and identification of cations by Paper Chromatographic technique

From the following mixtures :

a)  $\text{Ni}^{2+} + \text{Cu}^{2+}$  b)  $\text{Ni}^{2+} + \text{Co}^{2+}$

c)  $\text{Cu}^{2+} + \text{Co}^{2+}$

**Reference Books :**

- 1) Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
- 2) Vogel's Text Book of Qualitative Chemical Analysis (Longman ELBS Edition)
- 3) Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar.







**Solapur University, Solapur**  
**Nature of Question Paper For Semester Pattern**  
 • **Faculty of Science**  
 (w.e.f. June 2010)

**Time :- 2 hrs.**

**Total Marks-50**

- Q.No.1) Multiple choice questions. (10)**
- 1) -----  
 a)            b)            c)            d)
- 2)  
 3)  
 4)  
 5)  
 6)  
 7)  
 8)  
 9)  
 10)
- Q.No.2) Answer any Five of the following (10)**
- i)  
 ii)  
 iii)  
 iv)  
 v)  
 vi)
- Q.No.3) A) Answer any Two of the following (06)**
- i)  
 ii)  
 iii)
- B) Write the Answer/Solve/Problem/Note (04)**
- Q.No.4) Answer any Two of the following (10)**
- i)  
 ii)  
 iii)
- Q.No.5) Answer any Two of the following (10)**
- i)  
 ii)  
 iii)

## 1. Structure of the courses :-

- A) Each paper of every subject for Arts, Social Sciences & Commerce Faculty shall be of 50 marks as resolved by the respective faculties and Academic Council.
- B) For Science Faculty subjects each paper shall be of 50 marks and practical for every subject shall be of 50 Marks as resolved in the faculty and Academic Council.
- C) For B. Pharmacy also the paper shall be of 50 marks for University examination. Internal marks will be given in the form of grades.
- D) For courses which were in semester pattern will have their original distribution already of marks for each paper.
- E) For the faculties of Education, Law, Engineering the course structure shall be as per the resolutions of the respective faculties and Academic Council.

## 2. Nature of question paper:

### A) Nature of questions.

“20% Marks - objectives question” **(One mark each and multiple choice questions)**

“40% Marks - Short notes / Short answer type questions / Short Mathematical type questions/ Problems. **(2 to 5 Marks each)**

“40% Marks - Descriptive type questions / Long Mathematical type questions / Problems. **(6 to 10 Marks each)**

- B) Objective type question will be of multiple choice (MCQ) with four alternatives. This answer book will be collected in first 15 minutes for 10 marks and in first 30 minutes for 20 marks. Each objective question will carry one mark **each**.
  - C) Questions on any topic may be set in any type of question. All questions should be set in such a way that there should be permutation and combination of questions on all topics from the syllabus. As far as possible it should cover entire syllabus.
  - D) There will be only five questions in the question paper. All questions will be compulsory. There will be internal option **(30%)** and not overall option. **for questions 2 to 5.**
3. Practical Examination for B. Sc. I. will be conducted at the end of second semester.
4. Examination fees for semester Examination will be decided in the Board of Examinations.

The structures of all courses in all Faculties were approved and placed before the Academic Council. After considered deliberations and discussion it was decided not to convene a meeting of the Academic Council for the same matter as there is no deviation from any decision taken by Faculties and Academic Council. Nature of Question Paper approved by Hon. Vice Chancellor on behalf of the Academic Council.