

Dissemination of Education for Knowledge, Science and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

**Shri Swami Vivekanand Shikshan Sanstha's
Vivekanand College, Kolhapur
(Empowered Autonomous)**



DEPARTMENT OF CHEMISTRY
Three Years UG Programme
Department/Subject Specific Core or Major (DSC)

**Curriculum, Teaching and
Evaluation Structure**
As Per NEP 2020

For
B. Sc. Part - I Chemistry (NEP - 2.0)
Semester-I & II

SYLLABUS

to be implemented from Academic Year 2024-25

VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)
Department of Chemistry

Program Outcomes (POs):

PO1: Disciplinary Knowledge: Graduates will gain in-depth understanding in their specific major or discipline, mastering the foundational principles and theories, as well as advanced concepts. Execute strong theoretical and practical understanding developed from the specific programme in the area of work.

PO2: Problem-Solving Skills: Graduates will learn to use their knowledge to identify, analyze, and solve problems related to their field of study.

PO3: Analytical Skills: Graduates will gain the ability to collect, analyze, interpret, and apply data in a variety of contexts. They might also learn to use specialized software or equipment.

PO4: Research Skills and Scientific temper: Depending on the field, graduates might learn how to design and conduct experiments or studies, analyze results, and draw conclusions. They might also learn to review and understand academic literature.

PO5: Communication Skills: Many programs emphasize the ability to communicate effectively, both orally and in writing. Graduates may learn to present complex information clearly and succinctly, write detailed reports, and collaborate effectively with others.

PO6: Ethics and Professionalism: Graduates may learn about the ethical and professional standards in their field, and how to apply them in real-world situations.

B.Sc. in Chemistry

Program Specific Outcomes (PSOs):

After successful completion of degree program in Chemistry a student should be able to;

PSO1: Understand fundamental facts and concepts in Chemistry as well as its applications so as to develop interest in the study of chemistry as a discipline.

PSO2: Develop the ability to apply the principles of Chemistry in practical.

PSO3: Acquire skills of different analytical techniques used in chemistry.

PSO4: Develop Skills to evaluate, analyze and interpret the chemical reactions by using various techniques.

PSO5: Acquire knowledge and skills required to hire in any sector related to chemistry as well as to admit for higher education.

VIVEKANAND COLLEGE, KOLHAPUR (EMPOWERED AUTONOMOUS)

Department of Chemistry
Teaching and Evaluation Scheme
(2024-25 onwards for NEP-2.0)

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC) as per NEP-2020

B.Sc. Stream

UG Certificate (B. Sc.-I Semester- I & II)

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	SEE	CIE	PR/PRO	Marks	
Semester-I										
1	DSC-I	2DSC03CHE11	Inorganic Chemistry	2	-	40	10	-	50	2
2	DSC-II	2DSC03CHE12	Organic Chemistry	2	-	40	10	-	50	2
3	DSC-PR-I	2DSC03CHE19	Chemistry Lab-1	-	4	-	-	25	25	2
4	OEC-PR-I	2OEC03CHS11	General Practical Course in Chemistry-1	-	4	-	-	25	25	2
Semester-I Total				6	8	80	20	50	150	8
Semester-II										
1	DSC-III	2DSC03CHE21	Physical Chemistry	2	-	40	10	-	50	2
2	DSC-IV	2DSC03CHE22	Analytical Chemistry	2	-	40	10	-	50	2
3	DSC-PR-II	2DSC03CHE29	Chemistry Lab-2	-	4	-	-	25	25	2
4	OEC-PR-II	2OEC03CHS21	General Practical Course in Chemistry-2	-	4	-	-	25	25	2
Semester-II Total				6	8	80	20	50	150	8
Total				12	16	160	40	100	300	16

Abbreviations: TH-Theory, PR-Practical, PRO- Project, SEE- Semester End Examination, CIE-Continuous Internal Examination

Note: Minimum passing for 10 marks Internal evaluation = 04 marks

Minimum passing for 40 marks Theory paper = 16 marks

Minimum passing for 25 marks Practical = 10 marks

Passing percentage for Democracy, Election and Good Governance (DEGG) and Environmental Studies papers should be 40%

Separate passing for each Head - SEE, CIE and Practical

B. Sc. Part - I Semester - I CHEMISTRY
DSC-I: 2DSC03CHE11: INORGANIC CHEMISTRY

Theory: 30 hrs
Marks-50 (Credits: 02)

- CO No. On completion of the course, student will be able to:**
- CO1 Learn introductory inorganic chemistry and understand size, shape and electron distribution in shells and sub-shells of an atom.
- CO2 Impart different types of bonds and nature of bonding in inorganic compounds, calculations of different energies associated with ionic bonding.
- CO3 Acquire knowledge of nature of bonding, geometry, stability and magnetic characters of covalent compounds by applying VBT.
- CO4 Learn various characteristics and compounds of group 13, 14 and 15 in periodic table.

Unit - I:	Atomic Structure and Periodicity of Elements 1.1 Introduction, Bohr's theory of hydrogen atom and its limitations 1.2 Wave particle duality 1.3 Heisenberg uncertainty principle 1.4 Quantum numbers and their significance 1.5 Shapes of s, p and d atomic orbitals 1.6 Electrons filling rules in various orbitals: a) Aufbau's principle b) Hund's rule of maximum multiplicity c) Pauli's exclusion principle. 1.7 Electronic configuration of elements. Stability of empty, half-filled and completely filled orbitals. 1.8 Periodicity of the elements: General discussion of the following properties of the elements with reference to s block elements: a) electronic configuration b) atomic radii c) ionic radii d) ionization energy e) electron affinity f) electronegativity g) metallic characters h) reactivity i) oxidation state j) melting and boiling points k) chemical	[8]
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	properties.	
Unit - II:	Chemical Bonding and Molecular Structure: Ionic Bonding 2.1 Introduction 2.2 Types of Chemical Bonds: a) Ionic Bond b) Covalent Bond c) Co-ordinate bond d) Metallic bond e) Hydrogen Bond f) Van-der walls force. 2.3 Definition and formation of ionic bond. General characteristics of ionic bonding. 2.4 Energetic in Ionic bond formation. 2.5 Born-Haber cycle for NaCl and its applications. 2.6 Fajan's Rule, Applications of Fajan's rule for, i) Polarizing power and polarizability ii) Ionic character in covalent compounds iii) Bond moment, dipole moment and percentage ionic character.	[7]
Unit-III:	Chemical Bonding and Molecular structure: Valence bond theory (VBT) 3.1 Introduction, Heitler - London Theory, Pauling-Slater theory 3.2 Valence Bond Theory: Concept of hybridization, different types of hybridization and geometry of following molecules, i) Linear geometry - BeCl_2 (sp hybridization) ii) Planer trigonal geometry - BF_3 (sp^2 hybridization) iii) Tetrahedral geometry - SiCl_4 (sp^3 hybridization) iv) Trigonal bipyramidal geometry - PCl_5 (sp^3d hybridization) v) Octahedral geometry - SF_6 (sp^3d^2 hybridization) vi) Pentagonal bipyramidal geometry - IF_7 (sp^3d^3 hybridization) 3.3 VSEPR Theory with reference to ammonia and water.	[8]
Unit-IV:	p-Block Elements (Group 13, 14, 15) 4.1 Position of elements in periodic table.	[7]

	<p>4.2 Characteristics of group 13th, 14th and 15th elements with special reference to electronic configuration and periodic properties.</p> <p>4.3 Compounds of group 13th, 14th and 15th elements.</p> <p>i) Boron-diborane (only structure).</p> <p>ii) Allotropes of carbon and phosphorus.</p> <p>iii) Oxyacids of Nitrogen (HNO₂, HNO₃).</p>	
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Reference Books:

- 1) Lee, J. D. *Concise Inorganic Chemistry* ELBS, 1991.
- 2) Cotton, F. A., Wilkinson, G. & Gaus, P. L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- 3) Douglas, B. E., McDaniel, D. H. & Alexander, J. J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- 4) Huheey, J. E., Keiter, E. A., Keiter, R. L. & Medhi, O. K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
- 5) Puri, Sharma, Kalia, *Principles of Inorganic Chemistry*
- 6) Suratkar and Thatte, *Theoretical Inorganic Chemistry*
- 7) Day and Selbin, *Theoretical Inorganic Chemistry*
- 8) R. Gopalan & Ramalingum, *Coordination Chemistry*
- 9) Satyaprakash, Tuli and Madan, *Advanced Inorganic Chemistry*
- 10) Huheey, J.E. *Principles of Structure and Reactivity*.
- 12) Huheey, J.E *Inorganic Chemistry*.
- 13) Gary Meissler and Donald Tarr., *Inorganic Chemistry*.
- 14) D.F. Shriver & P.W. Atkins, *Inorganic Chemistry*.
- 15) E. S. Gilreath. *Fundamental Concepts of Inorganic Chemistry*

B. Sc. Part- I Semester - I CHEMISTRY
DSC-II: 2DSC03CHE12: ORGANIC CHEMISTRY

Theory: 30 hrs.

Marks-50 (Credits: 02)

- CO No. On completion of the course, student will be able to:**
- CO1 Understand the fundamental concepts in Organic Chemistry.
- CO2 Learn the spatial arrangement of atoms of organic molecule and their effect on properties of organic molecules.
- CO3 Gain knowledge about heterocyclic compounds and its properties.
- CO4 Impart concepts of aromaticity as well as electrophilic substitution reactions.

Unit-I:	Unit I: Fundamentals of Organic Chemistry 1.1 Introduction 1.2 Inductive, electromeric, resonance and hyperconjugation effect. 1.3 Cleavage of bonds- homolysis, heterolysis 1.4 Types of reagents and organic reactions. 1.5 Introduction of reactive intermediates, carbocation, carbanion, carbon free radical, carbene with their generation, structure, stability.	[8]
Unit-II:	Stereochemistry 2.1 Concept of stereochemistry 2.2 Types of stereoisomerism 2.3 Chiral and achiral compounds 2.4 Optical isomerism in lactic acid, tartaric acid, 2, 3-dihydroxybutanoic acids 2.5 Enantiomerism and diastereomerism, Geometrical isomerism. 2.6 Introduction, configuration and geometrical isomerism in aldoxime & ketomixes. 2.7 Nomenclature of stereoisomerisms CIP rules, R and S, E and Z (cis & trans).	[8]

Unit-III:	Heterocyclic Compounds 3.1 General Introduction 3.2 Classification and Nomenclature of Heterocyclic compounds 3.3 Pyrrole: Introduction, Synthesis, physical and chemical properties. 3.4 Pyridine: Introduction, Synthesis, physical and chemical properties.	[7]
Unit-IV:	Chemistry of Aromatic Hydrocarbons 4.1 Introduction to homocyclic and polycyclic aromatic hydrocarbons benzene, naphthalene, anthracene 4.2 Meaning of important terms; aromatic, non-aromatic, anti-aromatic 4.3 Huckel's rules and its applications. 4.4 Benzene structure – MOT and VBT. 4.5 Aromatic electrophilic substitution reactions: General mechanism, effect of substitution groups, Mechanism of nitration, sulfonation, halogenations, Friedel-crafts alkylation & acylation reactions of benzene.	[7]

Reference Books:

- 1) Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
- 2) McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- 3) Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- 4) Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill education, 2000.
- 5) Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- 6) Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- 7) Tiwari, Vishnoi Textbook of Organic Chemistry.
- 8) R. K. Bansal Textbook of Organic Chemistry.

- 9) E. S. Gould Mechanism and structure in organic chemistry.
- 10) Bhal and Bhal Textbook of Organic Chemistry
- 11) Jerry March Advanced Organic Chemistry
- 12) Phatak, Mahagani, Modern Organic Chemistry
- 13) G.R. Chatwal, reaction Mechanism and reagents in Organic Chemistry
- 14) Stereochemistry by P. S. Kalsi (New Age International)
- 15) Organic Chemistry- Clayden, Greeves, Warren.
- 16) Reaction and rearrangement- S. N. Sanyal.
- 17) Organic Reaction Mechanism- V. K. Ahluwalia.
- 18) Advanced Organic Chemistry- Jagdamba Singh.

B. Sc. Part – I Semester - I CHEMISTRY
DSC- PR-I: 2DSC03CHE19: CHEMISTRY LAB-1
Practical: Four hours week per batch
Marks: 25 (Credits: 02)

- 1) Estimation of Acetic acid from the given vinegar sample by titrimetric method.
- 2) Estimation of Cu (II) ions by iodometric titration by using $\text{Na}_2\text{S}_2\text{O}_3$ solution
- 3) **Spot Tests** (Any Two)
Detection of following cations using spot tests: Cu^{2+} , Co^{2+} , Ni^{2+} , Fe^{3+} , Al^{3+} , Zn^{2+} , Mg^{2+} , Pb^{2+}
- 4) **Paper Chromatography** (Any Three)
Detection of following cations using Paper Chromatography: $\text{Cu}^{2+} + \text{Co}^{2+}$, $\text{Co}^{2+} + \text{Ni}^{2+}$, $\text{Ni}^{2+} + \text{Cu}^{2+}$
- 5) Organic Spotting – Compounds containing C, H, (O) (Any Four)
- 6) Preparation of Derivatives:
Preparation of Urea Oxalate.
Preparation of 2,4-DNP of ketones.
Preparation of Osazone.
- 7) To determine normality of bulk solution of HCl/ H_2SO_4 .
- 8) Estimation of Phenol
(Note: Any other relevant experiment may be added if required.)

Reference Books:

- 1) Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- 2) Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- 3) Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- 4) Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- 5) Khosla, B. D.; Garg, V. C. and Gulati, A. *Senior Practical Physical Chemistry*, S. Chand & Company, New Delhi, 2011.
- 6) Nadkarni, Kothari and Lavande *Practical Book of Physical Chemistry*
- 7) Findley A., *Experimental Physical Chemistry*
- 8) Das, R. C., B, Behra, *Experimens in Physical Chemistry*

- 9) Yadav J. B. *Advance Practical Physical Chemistry*
- 10) Clarke *Handbook of Organic Quantitative Analysis*
- 11) Ahluvalia V. K., *Comprehensive Practical Organic Chemistry*
- 12) Kulkarni, V. S., Dastane, R. *Laboratory Handbook of Organic Qualitative Analysis and Separation*
- 13) Khopkar, S. M., *Basic Concepts in Analytical Chemistry*

B. Sc. Part – I Semester - II CHEMISTRY
DSC-III: 2DSC03CHE21: PHYSICAL CHEMISTRY

Theory: 30 hrs.

Marks-50 (Credits: 02)

CO No.	On completion of the course, student will be able to:
CO1	Acquire knowledge of basic concepts and applications of thermodynamics.
CO2	Gain knowledge about basic concepts in kinetics and first order, second order reactions with characteristics.
CO3	Learn properties of liquid and apply this for the determination by various techniques.
CO4	Understand basic concepts in electrochemistry, conductors and conductivity cells, measurement of conductance.

Unit-I:	Thermodynamics 1.1 Introduction: <ul style="list-style-type: none">• Overview of thermodynamics• Importance and applications in various fields 1.2 Basic terms used in thermodynamic study <ul style="list-style-type: none">• System, surroundings, and boundary• Types of systems: open, closed, and isolated• State, process, cycle, and equilibrium• Properties: intensive and extensive 1.3 Zeroth law of thermodynamics <ul style="list-style-type: none">• Concept of thermal equilibrium• Statement and significance• Temperature and its measurement 1.4 First law of thermodynamics: Mathematical equation, sign conventions, statements of first law and its limitations. <ul style="list-style-type: none">• Mathematical formulation of the first law• Sign conventions for work and heat• Detailed statement of the first law• Limitations of the first law	[7]
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	<p>1.5 Spontaneous and non-spontaneous processes, Second law of thermodynamics.</p> <ul style="list-style-type: none"> • Definition and examples of spontaneous processes • Criteria for spontaneity • Introduction to the second law of thermodynamics <p>1.6 Carnot's Heat engine</p> <ul style="list-style-type: none"> • Statements of the second law: Kelvin-Planck and Clausius • Concept of entropy • Direction of natural processes <p>1.7 Carnot's Cycle and efficiency of heat engine.</p> <ul style="list-style-type: none"> • Definition and working of a heat engine • Explanation of Carnot's cycle • Calculation of efficiency for heat engines • Limitations and practical considerations <p>1.8 Numerical Problems</p> <ul style="list-style-type: none"> • Practice problems covering all topics in Unit I • Application of laws and concepts to solve thermodynamic problems 	
<p>Unit-II:</p>	<p>Chemical Kinetics</p> <p>2.1 Overview of Chemical Kinetics Definition and Units of i) rate of reaction, ii) rate constant.</p> <p>2.2 Factors affecting rate of reaction</p> <p>2.3 Order and Molecularity of reaction</p> <p>2.4 First order reaction: Derivation of rate constant. Characteristics of the first order reaction</p> <p>2.5 Pseudo-first order reactions - i) Hydrolysis of methyl acetate in presence of acid, ii) Inversion of cane sugar</p> <p>2.6 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants</p> <p>2.7 Examples of Second order reaction: i) Reaction between $K_2S_2O_8$ and KI and ii) Saponification of ethyl acetate</p>	<p>[8]</p>

	<p>2.8 Characteristics of Second order reactions</p> <p>2.9 Numerical problems</p>	
Unit-III:	<p>Physical properties of liquids</p> <p>3.1 Introduction to states of matter, qualitative description of intermolecular forces in liquids, structure of liquids, classification of physical properties</p> <p>3.2 Surface tension and its determination using stalagmometer and Differential Capillary rise method</p> <p>3.3 Viscosity and its determination using Ostwald's viscometer</p> <p>3.4 Refractive index (Snell's law) specific and molecular refractivities and its determination using Abbe's refractometer</p> <p>3.5 Numerical Problems.</p>	[7]
Unit-IV:	<p>Electrochemistry</p> <p>4.1 Introduction, types of cell, phenomenon of electrolysis, Faradays Laws of electrolysis</p> <p>4.2 Types of conductors</p> <p>4.3 Explanations of Conductance, specific conductance, equivalence and molecular conductance</p> <p>4.4 Variation of specific conductance, equivalence and molecular conductance with dilution, equivalent conductance at infinite dilution</p> <p>4.5 Dipping type of conductivity cell, modifications in the technique used before measurement of conductance w.r.to use of alternating current, use of conductivity water, conductivity cell and temperature control</p> <p>4.6 Measurement of conductance by Wheatstone bridge</p> <p>4.7 Cell constant and its determination</p> <p>4.8 Numerical problems.</p>	[8]

Reference Books

- 1) Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- 2) Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage

Learning India Pvt. Ltd., New Delhi (2009).

- 3) Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
- 4) Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).
- 5) Puri, Sharma, Pathania, *Principles of Physical Chemistry*.
- 6) *Principles of Physical Chemistry* by murrnpruton.
- 7) S.K. Dogra and Dogra. *Physical Chemistry*
- 8) Engel and Red, *Principles of Thermodynamics*
- 9) Peter and Atkins. *Physical Chemistry*
- 10) Glasston and Levis *Principle of Physical Chemistry*
- 11) Bhal & Tuli, *Physical Chemistry*

B. Sc. Part – I Semester - II CHEMISTRY
DSC-IV: 2DSC03CHE22: ANALYTICAL CHEMISTRY

Theory: 30 hrs.

Marks-50 (Credits: 02)

CO No.	On completion of the course, student will be able to:
CO1	Learn concepts of analytical chemistry.
CO2	Understand the various aspects of industrial chemistry such as MSDS, preparation of various solutions and IPR.
CO3	Acquire knowledge of chromatographic separation technique such as Paper and Thin layer chromatography.
CO4	Gain theoretical concepts of various volumetric titrations.

Unit-I:	Introduction to Analytical Chemistry 1.1 General Introduction 1.2 Importance of analysis 1.3 Analytical processes (Qualitative and Quantitative) 1.4 Methods of analysis (Only classification) 1.5 Sampling of solids, liquids and gases 1.6 Errors, types of errors (determinate and indeterminate), methods of expressing accuracy (Absolute and relative error) 1.7 Significant figures, mean, median, standard deviation 1.8 Numerical problems	[7]
Unit-II:	Fundamentals of Industrial Chemistry and IPR 2.1 General introduction, Difference between classical and industrial chemistry, Raw materials for chemical industry, Material safety data sheets (MSDS) 2.2 Definition and Explanation of terms -Molecular weight, Equivalent weight, Molarity, Normality, Molality, Molarity of mixed solution, Acidity of base, Basicity of acid, ppt, ppm, ppb solutions, Mole Fraction, Weight fraction, Percentage composition by W/W, W/V, V/V, Problems based on Normality, Molarity, mole fraction, mixed solution, etc.	[8]

	2.3 IPR - Introduction to IPR and its significance in present scenario	
Unit-III:	Chromatography 3.1 Introduction, Basic Principle of Chromatography, Basic terms, Classification of Chromatography 3.2 Paper Chromatography- Principle, Methodology-types of papers and treatment, sample loading, choice of solvent, development-ascending, descending, circular, location of spots, determination of R_f value, Applications, advantages and disadvantages 3.3 Thin layer chromatography -Principle, Solvent system, stationary phases, preparation of TLC plate, Detecting reagents, methodology - sample loading, development, detection of spot, R_f value, Applications, advantages and disadvantages. 3.4 Comparison of paper chromatography and TLC	[8]
Unit-IV:	Theory of titrimetric Analysis 4.1 Introduction 4.2 Acid-base indicators 4.3 Theory of indicators w.r.t. Ostwald's ionization theory and quinoid theory 4.4 Neutralization curves and choice of indicators for i) Strong acid-strong base ii) Strong acid-weak base iii) Strong base-weak acid 4.5 Complexometric titrations: Introduction, Types of EDTA titrations, Metallochromic indicators- Eriochrome black-T Indicator, Action of Eriochrome black-T	[7]

Reference Books:

- 1) Principles of Physical Chemistry by Puri, Sharma and Pathania, Vishal Publishing company Jalindhar
- 2) Essential of Physical Chemistry by Bahl B.S., Tuli G.D. and Bahl Arun, S.Chand and Company Ltd. New Delhi
- 3) Modern Analytical Chemistry by David Harvey, McGRAW-Hill International Edition, 2000
- 4) Industrial chemistry by B.K. Sharma, G Majorl Publishing Housing,16th edition 2011
- 5) Advanced Inorganic Chemistry, Vol.No.1, by Gurudeep Raj, Krishna Prakashan Media Ltd, Meerut
- 6) Analytical chemistry by B.K. Sharma, Krishna Prakashan Media Ltd, Meerut, edition 3rd 2011
- 7) Principles of electroplating and electroforming by Blum and Hogaboom
- 8) Chemical Process Industries by Shreve and Brink
- 9) Industrial Chemistry by Loutfy Madkor and Helen Njenga
- 10) Elementary Principles of Chemical Processes by Richard Felder and Ronald Rousseau, John Wiley and Sons

B. Sc. Part – I Semester - II CHEMISTRY
DSC- PR-II: 2DSC03CHE29: CHEMISTRY LAB-2
Practical: Four hours week per batch
Marks: 25 (Credits: 02)

- 1) Water analysis: To determine the alkalinity of water sample by using Phenolphthalein and Methyl Orange Indicator
- 2) Water analysis: To determine the acidity of water sample by using Phenolphthalein Indicator
- 3) To prepare standard 0.1 N KMnO_4 solution and to determine the strength of given oxalic acid solutions.
- 4) To determine quantity of Fe (II) ions from the given solutions by titrating it with 0.1N $\text{K}_2\text{Cr}_2\text{O}_7$ solutions by using internal indicator.
- 5) Preparation of Urea Formaldehyd Resin.
- 6) Organic Spotting – (Any Four)
- 7) Estimation of Aniline
- 8) Estimation of Acetamide
- 9) To study the reaction rate of hydrolysis of methyl acetate in presence of 0.5N HCl.
- 10) To determine viscosity of given liquid A and B.
- 11) To determine equivalent weight of Mg by Eudiometer.
- 12) Determination of enthalpy of ionization of acetic acid.

(Note: Any other relevant experiment may be added if required.)

Reference Books:

- 1) Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- 2) Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- 3) Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- 4) Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- 5) Khosla, B. D.; Garg, V. C. and Gulati, A. *Senior Practical Physical Chemistry*, S. Chand & Company, New Delhi, 2011.
- 6) Nadkarni, Kothari and Lavande *Practical Book of Physical Chemistry*
- 7) Findley A., *Experimental Physical Chemistry*

- 8) Das, R. C., B, Behra, *Experimens in Physical Chemistry*
- 9) Yadav J. B. *Advance Practical Physical Chemistry*
- 10) Clarke *Handbook of Organic Quantitative Analysis*
- 11) Ahluvalia V. K., *Comprehensive Practical Organic Chemistry*
- 12) Kulkarni, V. S., Dastane, R. *Laboratory Handbook of OrganicQualitative Analysis and Separation*
- 13) Khopkar, S. M., *Basic Concepts in Analytical Chemistry*

Scheme of teaching and examination

- The semester examination will be conducted at the end of each term (both theory and practical examination)
- Theory paper will be of 40 marks each and 10 marks for internal evaluation (CIE) conducted in the mid of the term. One practical will be of 25 mark.
- Question papers will be set in the view of the entire syllabus and preferably covering each unit of the syllabus.

Seat No.	
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Ques. paper code	
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VIVEKANAND COLLEGE, KOLHAPUR (EMPOWERED AUTONOMOUS)

B.Sc. Part- I (Chemistry) (Semester-I) Examination.....

Course Code and Name: DSC03CHEM11: Inorganic Chemistry

Day:

Time: 2 hours

Date: --/--/----

Marks : 40

Instructions:

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labelled diagrams wherever necessary.
- 4) Use of log table/calculator is allowed.

Q. 1. Select correct alternative (One mark each):

[8]

- i) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- ii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- iii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- iv) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- v) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- vi) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- vii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----
- viii) Xyzabcdefghijklmnop -----
a) ----- b) ----- c) ----- d) -----

Q.2. Attempt any TWO (Eight marks each):

[16]

- i) Xyzabcdefghijklmnop.

ii) Xyzabcdefghijklmnop.

iii) Xyzabcdefghijklmnop.

Q.3. Attempt any FOUR (Four marks each):

[16]

i) Xyzabcdefghijklmnop.

ii) Xyzabcdefghijklmnop.

iii) Xyzabcdefghijklmnop.

iv) Xyzabcdefghijklmnop.

v) Xyzabcdefghijklmnop.

vi) Xyzabcdefghijklmnop.

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Evaluation Pattern for practical Course:

Marks Distribution of Practical (LAB) course: Total Marks: 25

Course	Experimental work	Journal assessment	Seminar/ Mini Project	Total Marks
Major	20	05	-	25
OE	20	05	-	25

Dissemination of Education for Knowledge, Science and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

**Shri Swami Vivekanand Shikshan Sanstha's
Vivekanand College, Kolhapur
(Empowered Autonomous)**



DEPARTMENT OF CHEMISTRY
Three Years UG Programme
Department/Subject Specific Core or Major (DSC)

**Curriculum, Teaching and
Evaluation Structure**
As Per NEP 2020

For
B. Sc. Part - I Chemistry (NEP - 2.0) Open Elective (OE)
Semester-I & II

SYLLABUS

to be implemented from Academic Year 2024-25

VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)
Department of Chemistry

Program Outcomes (POs):

PO1: Disciplinary Knowledge: Graduates will gain in-depth understanding in their specific major or discipline, mastering the foundational principles and theories, as well as advanced concepts. Execute strong theoretical and practical understanding developed from the specific programme in the area of work.

PO2: Problem-Solving Skills: Graduates will learn to use their knowledge to identify, analyze, and solve problems related to their field of study.

PO3: Analytical Skills: Graduates will gain the ability to collect, analyze, interpret, and apply data in a variety of contexts. They might also learn to use specialized software or equipment.

PO4: Research Skills and Scientific temper: Depending on the field, graduates might learn how to design and conduct experiments or studies, analyze results, and draw conclusions. They might also learn to review and understand academic literature.

PO5: Communication Skills: Many programs emphasize the ability to communicate effectively, both orally and in writing. Graduates may learn to present complex information clearly and succinctly, write detailed reports, and collaborate effectively with others.

PO6: Ethics and Professionalism: Graduates may learn about the ethical and professional standards in their field, and how to apply them in real-world situations.

B.Sc. in Chemistry

Program Specific Outcomes (PSOs):

After successful completion of degree program in Chemistry a student should be able to;

PSO1: Understand fundamental facts and concepts in Chemistry as well as its applications so as to develop interest in the study of chemistry as a discipline.

PSO2: Develop the ability to apply the principles of Chemistry in practical.

PSO3: Acquire skills of different analytical techniques used in chemistry.

PSO4: Develop Skills to evaluate, analyze and interpret the chemical reactions by using various techniques.

PSO5: Acquire knowledge and skills required to hire in any sector related to chemistry as well as to admit for higher education.

VIVEKANAND COLLEGE, KOLHAPUR (EMPOWERED AUTONOMOUS)

Department of Chemistry
Teaching and Evaluation Scheme
(2024-25 onwards for NEP - 2.0)

Three/Four- Years UG Programme

Department/Subject Specific Core or Open Elective (OE)
as per NEP-2020

B.Sc. Stream

UG Certificate (B. Sc.-I Semester- I & II)

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme		Examination Scheme and Marks				Course Credits
				Hours/week		SEE	CIE	PR/PRO	Marks	
Semester-I										
1	DSC-I	2DSC03CHE11	Inorganic Chemistry	2	-	40	10	-	50	2
2	DSC-II	2DSC03CHE12	Organic Chemistry	2	-	40	10	-	50	2
3	IKS	2IKS03GEC11	Indian Knowledge System	2	-	50	-	-	50	2
4	DSC-PR-I	2DSC03CHE19	Chemistry Lab-1	-	4	-	-	25	25	2
5	OEC-PR-I	2OEC03CHS11	General Practical Course in Chemistry-1	-	4	-	-	25	25	2
Semester-I Total				6	8	130	20	50	200	10
Semester-II										
1	DSC-III	2DSC03CHE21	Physical Chemistry	2	-	40	10	-	50	2
2	DSC-IV	2DSC03CHE22	Analytical Chemistry	2	-	40	10	-	50	2
3	VEC	2VEC03CHE29	Democracy and Good Governance	2	-	50	-	-	50	2
4	DSC-PR-II	2DSC03CHE29	Chemistry Lab-2	-	4	-	-	25	25	2
5	OEC-PR-II	2OEC03CHS21	General Practical Course in Chemistry-2	-	4	-	-	25	25	2
Semester-II Total				6	8	130	20	50	200	10
Total				12	16	260	40	100	400	20

B. Sc. Part - I Semester - I CHEMISTRY (Open Elective)
OEC-PR-II: 2OEC03CHS11: GENERAL PRACTICAL COURSE IN
CHEMISTRY-1

Practical: Four hours week per batch

Marks: 25 (Credits: 02)

- 1) Estimation of Acetic acid from the given vinegar sample by titrimetric method.
- 2) Estimation of Cu (II) ions by iodometric titration by using $\text{Na}_2\text{S}_2\text{O}_3$ solution
- 3) **Spot Tests (Any Two)**
Detection of following cations using spot tests: Cu^{2+} , Co^{2+} , Ni^{2+} , Fe^{3+} , Al^{3+} , Zn^{2+} , Mg^{+2} , Pb^{2+}
- 4) **Paper Chromatography (Any Three)**
Detection of following cations using Paper Chromatography: $\text{Cu}^{2+} + \text{Co}^{2+}$, $\text{Co}^{2+} + \text{Ni}^{2+}$, $\text{Ni}^{2+} + \text{Cu}^{2+}$
- 5) Organic Spotting - Compounds containing C, H, (O) (Any Four)
- 6) Preparation of Derivatives:
Preparation of Urea Oxalate.
Preparation of 2,4-DNP of ketones.
Preparation of Osazone.
- 7) To determine normality of bulk solution of HCl/ H_2SO_4 .
- 8) Estimation of Phenol
(Note: Any other relevant experiment may be added if required.)

Reference Books:

- 1) Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- 2) Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- 3) Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- 4) Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- 5) Khosla, B. D.; Garg, V. C. and Gulati, A. *Senior Practical Physical Chemistry*, S. Chand & Company, New Delhi, 2011.
- 6) Nadkarni, Kothari and Lavande *Practical Book of Physical Chemistry*
- 7) Findley A., *Experimental Physical Chemistry*

- 8) Das, R. C., B, Behra, *Experimens in Physical Chemistry*
- 9) Yadav J. B. *Advance Practical Physical Chemistry*
- 10) Clarke *Handbook of Organic Quantitative Analysis*
- 11) Ahluvalia V. K., *Comprehensive Practical Organic Chemistry*
- 12) Kulkarni, V. S., Dastane, R. *Laboratory Handbook of OrganicQualitative Analysis and Separation*
- 13) Khopkar, S. M., *Basic Concepts in Analytical Chemistry*

B. Sc. Part - I Semester - II CHEMISTRY (Open Elective)
OEC-PR-II: 2OEC03CHS21: GENERAL PRACTICAL COURSE IN
CHEMISTRY-2

Practical: Four hours week per batch

Marks: 25 (Credits: 02)

- 1) Water analysis: To determine the alkalinity of water sample by using Phenolphthalein and Methyl Orange Indicator
- 2) Water analysis: To determine the acidity of water sample by using Phenolphthalein Indicator
- 3) To prepare standard 0.1 N KMnO_4 solution and to determine the strength of given oxalic acid solutions.
- 4) To determine quantity of Fe (II) ions from the given solutions by titrating it with 0.1N $\text{K}_2\text{Cr}_2\text{O}_7$ solutions by using internal indicator.
- 5) Preparation of Urea Formaldehyd Resin.
- 6) Organic Spotting - (Any Four)
- 7) Estimation of Aniline
- 8) Estimation of Acetamide
- 9) To study the reaction rate of hydrolysis of methyl acetate in presence of 0.5N HCl.
- 10) To determine viscosity of given liquid A and B.
- 11) To determine equivalent weight of Mg by Eudiometer.
- 12) Determination of enthalpy of ionization of acetic acid.

(Note: Any other relevant experiment may be added if required.)

Reference Books:

- 1) Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- 2) Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- 3) Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
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- 6) Nadkarni, Kothari and Lavande *Practical Book of Physical Chemistry*
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- 10) Clarke *Handbook of Organic Quantitative Analysis*
- 11) Ahluvalia V. K., *Comprehensive Practical Organic Chemistry*
- 12) Kulkarni, V. S., Dastane, R. *Laboratory Handbook of Organic Qualitative Analysis and Separation*
- 13) Khopkar, S. M., *Basic Concepts in Analytical Chemistry*

Evaluation Pattern for practical Course:

Marks Distribution of Practical (LAB) course: Total Marks: 25

Course	Experimental work	Journal assessment	Seminar/ Mini Project	Total Marks
Major	20	05	-	25
OE	20	05	-	25



S. D. Shirke
 Dr. (Mrs). S, D, Shirke
HEAD
 DEPARTMENT OF CHEMISTRY
 VIVEKANAND COLLEGE, KOLHAPUR
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