Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B^{++}'Grade (CGPA2.96)

Name of the Faculty: Science &Technology

(As per New Education Policy 2020)

Syllabus: Chemistry

Name of the Course: B.Sc. I (Sem. I & II)

(Syllabus to be implemented from June 2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Nep 2020 Compliant Curriculum
B.Sc. (Chemistry)
Program Preamble

The Bachelor of Science (BSc) in Chemistry is a comprehensive and dynamic program designed to provide students with a deep understanding of the fundamental principles of Chemistry, along with the practical skills required to apply this knowledge in various scientific and technological contexts. Aligned with the vision of the National Education Policy (NEP) 2020, the program offers a flexible, multidisciplinary, and learner-centric curriculum that encourages critical thinking, innovation, and holistic development. The BSc Chemistry program spans four years, with each year offering a progressively advanced curriculum designed to build a strong foundation in Chemistry while allowing for specialization and interdisciplinary learning. The curriculum is structured around several key components:

1. **Major Courses:** These core courses form the backbone of the program, providing in-depth knowledge and understanding of essential Chemistry concepts, theories, and methodologies. Students will engage with topics ranging from Chemical Kinetics, Gaseous State, VBT, MOT, Thermodynamics, Name reactions, Coordination Chemistry, Photochemistry, Nuclear Chemistry etc. ensuring a robust and comprehensive education in the discipline.
2. **Minor Courses:** Students have the opportunity to choose minor courses from related or distinct disciplines, promoting an interdisciplinary approach to learning. This flexibility allows students to complement their Chemistry education with insights from fields such as mathematics, Physics or microbiology, zoology, Botany, Geology for enhancing their versatility and broadening their career prospects.
3. **Open Electives/General Electives:** The program encourages intellectual exploration beyond the core discipline by offering a wide range of elective courses. These electives enable students to pursue their interests in diverse subjects, fostering creativity, critical thinking, and a well-rounded educational experience.
4. **Vocational and Skill Enhancement Courses:** Practical skills and technical proficiency are integral to the program, with vocational and skill enhancement courses providing hands-on experience in areas such as Water and soil analysis, Fertilizer and food analysis. These courses are designed to prepare students for immediate employment and equip them with the tools necessary for career advancement in various scientific and technological fields.
5. **Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):** In alignment with NEP 2020, the program integrates courses that emphasize the Indian Knowledge System, ethical values, and life skills. These courses foster a deep appreciation for India's rich cultural heritage, while also developing essential communication and ethical decision-making skills that are vital for personal and professional growth.
6. **Field Projects/Internships/Apprenticeships/Community Engagement Projects/On-Job Training:** To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. These experiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in Chemistry and related fields.
7. **Research Methodology and Research Projects:** Research is a critical component of the BSc Chemistry program, with students acquiring skills in research methodology, data collection, analysis, and scientific inquiry. By engaging in independent research projects, students are encouraged to develop innovative solutions to complex scientific problems, preparing them for advanced studies and research-oriented careers.

Multiple Entry and Multiple Exit Options

In accordance with the NEP 2020, the BSc Chemistry program incorporates a Multiple Entry and Multiple Exit framework, offering students the flexibility to enter or exit the program at various stages. This approach ensures

that students can tailor their educational journey according to their personal and professional goals, with options to earn certificates, diplomas, or degrees based on the duration of study completed.

- **Year 1:**
  Upon completion of the first year, students may exit with a **Certificate in Chemistry**.
- **Year 2:**
  After two years, students may choose to exit with a **Diploma in Chemistry**.
- **Year 3:**
  Completion of the third year qualifies students for a **BSc Degree in Chemistry**.
- **Year 4:**
  The fourth year offers an advanced curriculum with a focus on research, allowing students to graduate with an **Honors Degree in Chemistry**.

Eligibility for B.Sc. Chemistry: The candidate passing the higher secondary examination conducted by the Maharashtra State Board of Higher Secondary Education, with science stream MCVC with science subject, D. Pharm, Diploma Engineering, Agricultural Diploma, diary diploma shall be allowed to enter the B.Sc. Part I course. OR An Examination of any other statutory university or an examining body recognized as equivalent thereto.
Repeater student will be allowed to take fresh admission to the same class with same subjects or different subjects.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Nep 2020 Compliant Curriculum
BSc (Chemistry)
Program Outcomes (PO)

Students graduating from the Bachelor of Science in Chemistry program will be able to:

Major Courses:
- **PO1**: Demonstrate in-depth knowledge and understanding of core concepts, theories, and methodologies in the chosen major discipline.
- **PO2**: Apply disciplinary knowledge to solve complex problems, analyze data, and make informed decisions in professional and research contexts.

Minor Courses:
- **PO3**: Acquire complementary knowledge and skills from a related or distinct discipline, enhancing interdisciplinary understanding and versatility.

Open Electives/General Electives:
- **PO4**: Explore diverse subjects beyond the core discipline, fostering a broad-based education and cultivating critical thinking and creativity.

Vocational and Skill Enhancement Courses:
- **PO5**: Gain hands-on experience and technical proficiency in specific vocational areas, preparing for immediate career opportunities.

Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):

- **PO6**: Understand and appreciate the rich heritage of the Indian Knowledge System, integrating traditional wisdom with modern education.
- **PO7**: Develop ability enhancement skills like communication and life skills along with ethical values, social responsibility, and a strong sense of citizenship, contributing positively to society.

Field Projects/Internship/Apprenticeship/Community Engagement Projects/ On Job Training/ Internship/Apprenticeship:

- **PO8**: Apply theoretical knowledge to real-world situations through field projects, internships, community engagement and On job Training for gaining practical experience and problem-solving skills.

Research Methodology and Research Project:

- **PO9**: Acquire research skills, including data collection, analysis, and interpretation, fostering a scientific approach to problem-solving to develop independent research projects handling capabilities.

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Faculty of Science & Technology
Nep 2020 Compliant Curriculum

BSc (Chemistry)
Program Specific Outcomes (PSOs)

Students graduating from BSc (Chemistry) will able to :

PSO1. Understand basic principles of Organic, Physical, and Inorganic Chemistry.

PSO2. Identify and estimate the components of organic and inorganic chemicals and determine the physical properties of compounds. PSO3. Synthesize specified chemicals, characterize them, and interpret spectral data to elucidate the structure of the synthesized chemical compound.

PSO4. Solve problems in thermodynamics, electrochemistry, analytical chemistry, spectroscopy, and photochemistry etc.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Three Majors in First Year structure as per NEP-2020 Approved in For AC Meeting on 18/04/2024

4- Year Multidisciplinary UG Program with DSC as a Major (4 -Year Bachelor of Science (Honors)/(Honors with Research)

Level/ Difficulty	Sem.	Faculty			Generic/ Open Elective GE/ OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability Enhancement Course (AEC), IKS, VEC	Field Project/ RP/CC/Internship/Apprenticeship/ Community Engagement & Services	Credits	Cumulative Credits
		Major		Minor						
		DSC	DSE							
4.5 100-200	I	DSC1-1 (2+2)#	--		GE1/ OE1(2)	SEC1 (2)	L1-1(2) IKS (2) VEC1(2) (Indian Constitution And Democracy)	--	22	**44 UG Certificate (44)**
		DSC2-1 (2+2)#	--							
		DSC3-1 (2+2)#	--							
	II	DSC1-2 (2+2)#	--		GE2/ OE2(2)	SEC 2 (2)	L1-2(2) VEC2(2) (Environmental Studies)	CC1 (2)	22	
		DSC2-2 (2+2)#	--							
		DSC3-2 (2+2)#	--							
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor										
5.0/200	III	DSC1-3 (2+1)	---	DSC2-3 (2+1)	GE3 / OE3(2)	VSC1 (2) (DSC1) VSC2(2) (DSC2)	L2-1 (2)	CC2 (2)	22	**44 UG Diploma (88)**
		DSC1-4 (2+1)	---	DSC-2-4 (2+1)						
	IV	DSC1-5 (2+1)	---	DSC2-5 (2+1)	GE4/ OE4 (2)	VSC3 (2) (DSC1) VSC4(2) (DSC2)	L2 -2(2)	FP1/CEP1(2)	22	
		DSC1-6 (2+1)	--	DSC2-6 (2+1)						
Exit option: Award of UG Diploma in Major with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major										
5.5/300	V	DSC1-7 (3+2)	DSE1-1 (2+1) or DSE1-2 (2+1)	----	----	VSC3 (2) (Hands on Training related to DSE)	IKS 2 (2) (related to major subject)	--	22	**44 UG degree (132)**
		DSC1-8 (3+2)								
		DSC1-9 (3+2)								
	VI	DSC1-10 (3+2)	DSE1-3 (2+1) or DSE1-4 (2+1)	----	---	VSC4 (2) (Hands on Training related to DSE)		FP2/CEP2/OJT1 (2)	22	
		DSC1-11 (3+2)								
		DSC1-12 (3+2)								
	Total Credits 3 Yrs	**66-8#**	**6**	**12 +8# 20**	**08**	**16**	**16**	**08**	**132**	
Exit option: Award of UG degree in Major with 132 Credits OR Continue with Major										
6.0/400	VII	DSC1-13 (4+2)	DSE1-5 (4+2)	Research Methodology (4)	------	----	----	---	22	**44 UG Honours Degree in Main faculty (176)**
		DSC1-14 (4+2)								
	VIII	DSC1-15 (4+2)	DSE1-6 (4+2)		----	-----	----	OJT/In-house Project/ Internship/ Apprenticeship (4)	22	
		DSC1-16 (4+2)								
	Total 4 Yrs	**90-8#**	**18**	**16+8#**	**08**	**16**	**16**	**12**	**176**	
Award of Bachelor of Science Honors., (B.Sc. Honors.) degree with Major and Minor (176 credits)										

		OR								
6.0/400	VII	DSC1-13 (4) DSC1-14 (4)	DSE1-5 (4)	Research Methodology (4)	------	----	----	Research Project (6)	22	**44 UG Honours with research Degree in Main faculty (176)**
	VIII	DSC1-15 (4+2) DSC1-16 (4+2)	DSE1-6 (4)		----	-----	----	Research Project (6)	22	
	Total 4 Yrs	**86-8#**	**14**	**16+8#**	**08**	**16**	**16**	**20**	**176**	

#Out of the three major courses in the first year, one major (comprising 4 credits for the 1st semester and 4 credits for the 2nd semester) will transition into a minor starting from the second year. Consequently, 8 credits will be reallocated from the major course credit count and added to the minor credit count, thereby meeting the requisite credit criteria for the minor as stipulated in the guidelines.

Structure as per NEP-2020

B. Sc. I (Chemistry)

Level	**Sem**	**Major**		**VSC/ SEC**	**OE/GE**	**IKS**	**CC**	**Total Credits**	**Cumulative Credits**
		T	**P**						
4.5	I	2 2 2	2 2 2	SEC1-2	OE-1 /GE-1 (2)	L1- 2 IKS (General) 2 VEC 1-2 (Indian Constituency and Democracy	----	22	44
	II	2 2 2	2 2 2	SEC2 -2	OE-2 /GE-2 (2)	L2-2 VEC- 2 (Environmental Studies)	CC2-2	22	

S.No.	**Course Type with course code**	**Paper Title**	**Credit**
1.	Major DSC1-1 **G04-0102**	Chemistry-I (Physical and Inorganic Chemistry)	2
2.	Practical based on DSC1-1 **G04-0102-P**	Practical Lab – I	2
3.	Major DSC2-1	To be selected from Other than Chemistry	2
4.	Practical based on DSC2-1	Practical Lab – I	2
5	Major DSC3-1	To be selected from Other than Chemistry	2
6.	Practical based on DSC3-1	Practical Lab – I	2

7	GE-I/OE-I **G04-GE-OE-102**	Environmental Chemistry	2
8.	SEC I **G04-SEC-102**	Chemistry Skill Enhancement Course-I (Water and Soil Analysis)	2
9.	IKS **IKS-101**	General IKS	2
10.	AEC I **ENG-101**	English for communication	2
11	VEC I **ICD**	Indian Constitution and Democracy	2
		Total	**22**
12	Major DSC1 -2 **G04-0202**	Chemistry-II (Organic and Analytical Chemistry)	2
13	Practical based on DSC1 -2 **G04-0202**	Practical Lab - II	2
14.	Major DSC2-2	To be selected from Other than Chemistry	2
15	Practical based on DSC2-2	Practical Lab – II	2
16.	Major DSC3-2	To be selected from Other than Chemistry	2
17	Practical based on DSC3-2	Practical Lab – II	2
18.	GE-II/ OE-II **G04-GE-OE-202**	Chemistry in Daily Life	2
19	SEC II **G04-SEC-202**	Chemistry Skill Enhancement Course-II(Food and Fertilizer Analysis)	2
20	AEC II **ENG-201**	English for communication	2
21	VEC II **ENS24**	Environmental Studies	2
22	CC I **CES-201/ CC-201/ CC-202/ CC-203/ CC-204/ CC-205/ CC-206**	CC	2
		Total	**22**

Abbreviations:

OE: Generic/ Open Electives

VSEC: Vocational Skill and Skill Enhancement Courses

SEC: Skill Enhancement Courses

AEC: Ability Enhancement Courses

FP: Field projects

CC: Co-curricular Courses

RP: Research Project

IKS: Indian Knowledge System

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **First Year BSc (Chemistry) Semester-I** **Vertical : DSC** **Course Code: G04-0102** **Course Name: Chemistry-I** **(Physical and Inorganic Chemistry)**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Physical and Inorganic Chemistry is one of the core courses in the Chemistry curriculum and one of the traditional courses, dating back from the last many centuries. This course provides an in-depth understanding of the fundamental concepts in Chemical kinetics, Gaseous state, Covalent bonding: VBT and MOT approach. Students will study these subtopics in detail. By combining theoretical knowledge with numerical treatment, the course aims to develop practical skills in analyzing and optimizing the Chemistry concepts.

	Course Objectives:
•	To achieve knowledge of the gaseous states such as ideal and non-ideal gases, isotherm, and liquefaction of gases.
•	To acquire knowledge about rates of chemical reactions and distinguishing the reaction of a different order and their characteristics.
•	To proper understanding of covalent bonding using VBT and MOT approach.
•	To acquire knowledge of quantum mechanics, shapes of orbitals and periodic properties.
	Course Outcomes:
CO1:	Get a better understanding of gaseous state.
CO2:	Understand the significance of rates of chemical reactions.
CO3:	Explain the deviations of gases from ideality
CO4:	Describe the hybridization concept
CO5:	Construct the MO diagrams for simple molecules
CO6:	Understand different types of orbitals
Unit 1:	
A	**Gaseous State** **Hrs (07) Weightage: 11 Marks**
1.1	Ideal and Nonideal gases, Deviation from ideal behaviour.(Only Boyle's law),Causes of deviation from ideal behaviour, van der Waal's equation, explanation

	of real gas behaviour by van der Waal's equation.
1.2	Critical Phenomena: PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants.
1.3	Liquefaction of gases, Joule-Thomson effect.
1.4	Numerical Problems
B	**Chemical Kinetics Hrs (08) Weightage: 12 Marks**
2.1	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: with example of Ammonia synthesis by Haber's Process.
2.2	Order and Molecularity of reaction.
2.3	First order reaction: Derivation of Rate constant, Characteristics of first order reaction, Example: Decomposition of N_2O_5
2.4	Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants.Characteristics of Second order reaction, Example: Reaction between $K_2S_2O_8$ and KI
2.5	Pseudo-uni-molecular reaction, Example: Hydrolysis of methyl acetate in presence of an acid.
2.6	Numerical Problems
Unit 2:	
A	**Covalent bonding: Valence Bond Theory (VBT) approach Hrs (07) Weightage: 11 Marks**
3.1	Types of chemical bonds
3.2	Valence Bond Theory: Heitler–London Theory and Pauling-Slater Theory: Merits and Demerits
3.3	Need of Hybridization with respect to $BeCl_2$, BF_3, $SiCl_4$
3.4	Types of hybridization and shapes of simple inorganic molecules: PCl_5, SF_6
3.5	Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. NH_3, H_2O
B	**Covalent bonding: Molecular Orbital Theory (MOT) approach Hrs (08) Weightage: 12 Marks**
4.1	Atomic and Molecular orbitals.
4.2	L.C.A.O. Principle
4.3	Bonding, Antibonding and Nonbonding Molecular orbitals.
4.4	Conditions for successful overlap
4.5	Different types of overlap (s-s, s-p_x, p_x-p_x and p_y-p_y or p_z-p_z)
4.6	Energy level sequence of molecular orbitals for n=1and n =2
4.7	M.O. Diagrams for: a) Homonuclear diatomic molecule. H_2,Li_2,Be_2,C_2,N_2 and O_2 b) Heteronuclear diatomic molecules CO and NO w.r.t. bond order, stability and magnetic properties.

	Reference books:
1.	Chemical Kinetics by K.J. Laidler, Tata McGraw Hill Publishing Co. New Delhi.
2.	Physical Chemistry: S. Glasstone.
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.	Physical Chemistry Through problems: Dogra and Dogra (Wiley Eastern Ltd.,)
7.	Physical Chemistry: G. M. Barrow(Tata McGraw Hill)
8.	Essentials of Physical Chemistry: B.S. Bahl & G.D.Tuli (S. Chand)
9.	Principles of Physical Chemistry: B.R. Puri, L.R. Sharma and M.S. Patania, S.L.N. Chand & Co.1987
10.	Kinetics and Reaction Mechanisms by Frost and Pearson, Wiley, New York.
11.	University General Chemistry: C N R. Rao (McMillan)
12.	Advanced Inorganic Chemistry-Cotton and Wilkinson
13.	Inorganic Chemistry-J.E. Huheey
14.	Concepts and models of Inorganic Chemistry-Douglas & Mc-Daniel
15.	Principles of Inorganic Chemistry-Puri, Sharma
16.	New Concise Inorganic Chemistry-(ELBS)-J.D.Lee
17.	Textbook of Inorganic Chemistry- P.L.Soni
18.	Advanced Inorganic Chemistry-Satyaprakash, Tuli, Basu
19.	Theoretical Principles of Inorganic Chemistry-G. S. Manku
20.	Principles of Inorganic Chemistry-Puri, Sharma & Kalia
21.	Inorganic chemistry: Principles of structure and reactivity–J.E. Huheey
22.	Advanced Inorganic Chemistry, Vol.I– Gurudeep Raj
23.	A New Guide to Modern Valency Theory- G. J.Brown

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **First Year BSc (Chemistry) Semester-I** **Vertical : DSC** **Course Code: G04-0102-P** **Course Name: Chemistry-I-Practical Lab-I**
***Teaching Scheme** **Practical:04Hours/week, 02Credit**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Chemistry I practical is one of the core courses in the Chemistry curriculum. This course provides an in-depth understanding of the fundamental concepts in Physical and Inorganic chemistry. By combining theoretical knowledge with hands on practicals will helps students to develop practical skills in analyzing and optimizing the Physical and Inorganic Chemistry concepts.

	Course Objectives:
●	To develop practical skills in basic and conceptual Physical Chemistry.
●	To gain practical knowledge by applying the experimental methods to correlate with the theory.
●	To prepare students to determine rates of chemical reactions.
●	To develop students to learn measuring skills in practical.
●	To apply the analytical techniques and graphical analysis to the experimental data
	Course Outcomes:
	On successful completion of this practical course student will be able to:
●	handle various instruments.
●	correlate theoretical concepts with experiments.
●	develop awareness of minimizing errors.
●	develop basic skills of measurements
●	understand the theoretical principles of basic Practical chemistry.
	List of Experiments
Sr. No.	**Name of the Practical**
	Physical Chemistry (Any two from Chemical Kinetics)
1.	Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl.

2.	Study of specific reaction rate of hydrolysis of methyl acetate in presence of H_2SO_4
3.	Study of reaction between $K_2S_2O_8$ and KI (Equal Concentrations)
4.	Determination of equivalent weight of Mg by Eudiometer.
5.	Determination of heat of ionization of weak acid.
	Inorganic Chemistry **Inorganic Quantitative Analysis:** Volumetric Analysis (Any two)
1.	To prepare a standard solution of Oxalic acid and determine the strength of Sodium hydroxide solution in terms of normality and Kg/dm^3
2.	To prepare a standard solution of Oxalic acid and determine the strength of Potassium permanganate solution in terms of normality and Kg/dm^3
3.	To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality and Kg/dm^3 (Use internal indicator)
	Inorganic preparation:
1.	Preparation of ferrous ammonium sulphate
2.	Preparation of sodium cuprous thiosulphate
	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. Jahagirdar
8.	Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **First Year BSc (Chemistry) Semester-I** **Vertical : GE/OE** **Course Code: G04-GE-OE-102** **Course Name: Chemistry-GE/OE-I (Environmental Chemistry)**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Chemistry-GE/OE-I is one of the courses in the Chemistry curriculum. This course provides an in-depth understanding of the various pollutions like Air, water, soil and sound pollution. Students will learn the sources and causes of these pollutions. They will know various treatments to minimize these pollutions.

	Course Objectives:
●	To know basic terms in air pollution
●	To understand air pollutants
●	To know various sources of water pollution
●	To understand the methods of treatment for water pollution
	Course Outcomes:
●	CO1: Understand the basic terminology of air pollution
●	CO2: Know different types of pollution
●	CO3: Understand radioactive waste management
●	CO4: Explain the methods of treatment of water
●	CO5: Know various physical and chemical methods of removal of germs and bacteria
Unit I	
1	**Air Pollution** **Hrs: (08) Weightage: 8 Marks**
1.1	Introduction: Meaning of terms: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD).
1.2	Types of Pollution (only introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and Nuclear pollution.
1.3	Air Pollution: Classification of air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.
2	**Soil and Sound Pollution** **Hrs: (07) Weightage:11 Marks**
2.1	Soil Pollution: Sources, effects and control and management.

2.2	Sound Pollution: Sources, effects and control and management
Unit II:	**Water Pollution** **Hrs: (15) Weightage: 23 Marks**
3.1	Introduction: Resources of water, Types of water pollutants, Water Pollution and its sources (brief account)
3.2	Treatment of water: (A) Potable Water: Parameters of potability of water Step-I: Removal of suspended matter: (a) Prolonged storage, (b) Screening, (c) Sedimentation, (d) Coagulation, (e) Filtration. Step-II: Removal of germs and bacteria- Physical and Chemical methods. Physical Methods : (a) Boiling (b) Exposure to UV or Sunlight (c) Distillation. Chemical Methods : (a) Chlorination, (b) Fluorination, (c) Ozonisation, (d) Aeration, (e) Use of KMnO4. (B) Industrial Water: Mention names of the methods only, Ion exchange method in detail. (C) Municipal Sewage: Meaning of sewage, Mention the names of methods, Activated sludge process in detail.
	Reference books:
1.	Environmental Chemistry - A.K. De
2.	Environmental pollution analysis - S.M. Khopkar
3.	Industrial Chemistry : Rogers
4.	Industrial Chemistry : R.K.Das
5.	Industrial Chemistry : B. K. Sharma

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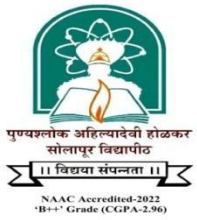
***Teaching Scheme** **Practical:04 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

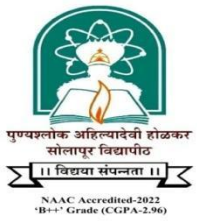
Course Preamble: Chemistry I practical is one of the core courses in the Chemistry curriculum. This course provides an in-depth understanding of the fundamental concepts in Physical and Inorganic chemistry. By combining theoretical knowledge with hands on practical will helps students to develop practical skills in analyzing and optimizing the Physical and Inorganic Chemistry concepts.

	Course Objectives:
●	To develop practical skills in basic and conceptual Chemistry.
●	To gain practical knowledge by applying the experimental methods to correlate with the theory.
●	To prepare students to analyze water samples.
●	To develop students to learn measuring skills in practical.
●	To prepare students to analyze soil samples.
	Course Outcomes:
	On successful completion of this practical course student will be able to:
●	handle various instruments.
●	correlate theoretical concepts with experiments.
●	develop awareness of minimizing errors.
●	develop basic skills of measurements
●	understand the theoretical principles of basic Practical chemistry.
	List of Experiments
Sr. No.	**List of the Practicals (any 10 practicals)**
A	**Water Analysis**
1.	To determine pH of given water samples (at least 5 soil samples).
2.	To determine electrical conductivity (EC) of given water samples (at least 5 soil samples).
3.	To determine carbonates from given water sample.
4.	To determine bicarbonates from given water sample.
5.	To determine Ca and Mg from given water sample.
6	To determine chlorides from given water sample.
7	To determine available potassium from given water sample by Flame photometer.
8	To determine available sodium from given water sample by Flame photometer.
B	**Soil Analysis**
9	Drying and sieving of soil samples (at least 5 soil samples).
10	To determine pH of given soil samples (at least 5 soil samples).
11.	To determine electrical conductivity (EC) of given soil samples (at least 5 soil samples).
12.	To determine available organic carbon from given soil sample by Walkley and Black method.

13	To determine available phosphorous from given soil sample.
14	To determine available nitrogen from given soil sample by Kjeldhal's method.
15	To determine available potassium from given soil sample by Flame photometer.
16	To determine available micronutrients (Cu/Mn/Fe/Zn) from given soil sample by AAS.
	Reference books
1	Methods of soil analysis : Uttam Kumar and Mishra
2	Soil analysis – P B Singh
3	Principles of soil and water analysis- N Panda
4	Soil testing and analysis- Vinod Kumar et.al
5	Methods of soil and water analysis- S. S. Yadhav and et.al.
5	A practical book on soil, plant, water and fertilizer analysis by Sarveshkumar Debey and Asha Arora
6	Practical manual for analysis of soil, water, fertilizer and manure by Javed Ahmad Sofi, S. A. Bangroo and M. A. Chesti

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year BSc (Chemistry) Semester-I** **Vertical : AEC** **Course Code: ENG-101** **Course Name: English for Communication-Paper-I**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year BSc (Chemistry) Semester-I** **Vertical : IKS** **Course Code: IKS-101** **Course Name: Introduction to Indian Knowledge System in Science**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year BSc (Chemistry) Semester-I** **Vertical : VEC** **Course Code: ICD** **Course Name: Indian Constitution and Democracy**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Semester II

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year BSc (Chemistry) Semester-II** **Vertical : DSC** **Course Code: G04-0202** **Course Name: Chemistry-II** **(Organic and Analytical Chemistry)**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Organic and Analytical Chemistry is one of the core courses in the Chemistry curriculum. This course provides an in-depth understanding of the fundamental concepts in Organic name reactions, structure and bonding, stereochemistry, physical properties of liquids, ionic solids and qualitative and quantitative analysis. Students will study these subtopics in detail. By combining theoretical knowledge with numerical treatment, the course aims to develop practical skills in analyzing and optimizing the Chemistry concepts.

	Course Objectives:
•	To study nature of bonding in organic molecules.
•	To inculcate the detailed basics of reaction mechanism and various intermediates
•	To study the different types of electronic effects.
•	To understand the stereochemistry of organic compounds.
•	To inculcate imagination and critical thinking of 3 D structures of organic compounds.
•	To study the unsaturated and alicyclic compounds.
•	To study the concept of aromaticity, its applications and reactions.
•	To know the important physical properties of liquids like viscosity, surface tension and refractive index.
•	To gain knowledge of ionic bonding and ionic solids.
•	To proper understanding of empirical and molecular formula of a compound
	Course Outcomes:
	CO1: Understand the basics of bonding and able to draw correct structure of any organic molecule and comment on its stability.
	CO2: Able to predict the reactivity of organic molecules by the help of electronic effects.
	CO3: Understand the basics of bonding and able to draw correct structure of any organic molecule and comment on its stability.
	CO4: Understand the basic physical properties

	CO5: To acquaint with instruments like refractometer, stalagmometer and viscometer
	CO6: Explain ionic bonding and different parameters of crystal structure.
Unit 1:	
A	**Fundamentals of organic reaction mechanism** **Hrs (05) Weightage: 5-8 Marks**
1.1	Introduction of reaction mechanism.
1.2	Types of arrow notations: Single headed curved arrow, Half headed curved arrow and double headed arrow.
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: Carbocations, Carbanions, Carbon free radicals, Carbenes, Nitrenes (Definition with suitable example, formation, structure, and relative stability)
B	**Structure and Bonding** **Hrs (05) Weightage: 8 Marks**
2.1	Hybridization:sp^3,sp^2ands p w.r.t. methane, ethylene and acetylene respectively
2.2	Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t.sp^3,$sp^2$and sp hybridization.
2.3	Resonance effect w.r.t. phenol and nitrobenzene
2.4	Inductive effect,+I and –I
2.5	Strength of carboxylic acid w.r.t. inductive effect: Examples-a)Formic and acetic acid,
2.6	Hyperconjugation w.r.t. toluene
2.7	Steric effect w.r.t. mesitoic acid
C	**Stereochemistry of organic compounds** **Hrs (05) Weightage: 8 Marks**
3.1	Types of stereo-isomerism: Optical isomerism, Geometrical isomerism and Conformational isomerism
3.2	Opticalactivity
3.3	Essential conditions for Optical activity i. Elements of symmetry ii. Chiral cente rw.r.t. lactic acid
3.4	Optical isomerism in lactic acid and tartaric acid
3.5	Enantiomers and diastereoisomers w.r.t. 2,3-dihydroxybutanoic acid
3.6	Racemic modification.
Unit 2:	
A	**Physical properties of liquids** **Hrs (10) Weightage: 15 Marks**

4.1	Introduction, additive and constitutive properties
4.2	Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer
4.3	Surface tension:-Determination of surface tension by Drop–Weight method
4.4	Refractive index, Snell's law
4.5	Specific and molecular refractivity, Abbe's refractometer: Critical angle Principle, construction, working and advantages
B	**Ionic Solids** **Hrs (05) Weightage: 8 Marks**
5.1	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 (NaCl) d) Fajan's rules
5	Radius ratio and crystal structure. a) Definition: Radius ratio (r^+/r^-), Coordination number, Stoichiometry and unit cell. b) Concept and calculation of radius ratio (r^+/r^-) for ionic solid with octahedral geometry. c) Radius ratio effect on geometry d) Crystal structure of NaCl and CsCl unit cell, radius ratio, coordination number and stoichiometry.
C	**Qualitativeand QuantitativeAnalysis** **Hrs (06) Weightage: 9 Marks**
6	Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur
6.2	Quantitative analysis of- - Carbon and hydrogen by Combustion method - Nitrogen by Kjeldahl's method - Halogen and Sulphur by Carius method.
6.3	Determination of molecular weight of an acid by titration method.
6.4	Empirical formula and molecular formula determination.
6.5	Numerical Problems
	Reference books:

1.	Organic Chemistry: Hendrickson, Cram, Hammond.
2.	Organic Chemistry: Morrison and Boyd
3.	Organic Chemistry: Volume I and III. L. Finar
4.	Organic Chemistry: Pine
5	Advanced Organic Chemistry: Sachinkumar Ghosh
6	Advanced Organic Chemistry:B.S.BahlandArunBahl
7	A Guide book to Mechanism in Organic Chemistry: Peter Sykes
8	Stereochemistry of Organic Chemistry: Kalsi,
9	Stereochemistry of Carbon Compounds: Eliel
	Textbook of Organic Chemistry: P. L.Sony
	Practical Organic Chemistry: A.I.Vogel
	Advanced Organic Chemistry: Reactions, Mechanism and Structure: Jerry March
	Organic Chemistry: M.R.Jain
	Organic Chemistry: J.M.Shaigel
	Svehla, G.Vogel's Qualitative Inorganic Analysis,Pearson Education,2012.
	Mendham,J.Vogel's Quantitative Chemical Analysis,Pearson,2009.
	Harris, D.C. Quantitative Chemical Analysis,W.H. Freeman.
	Dean, J.A. Analytical Chemistry Notebook, McGraw Hill.
	Day, R.A. & Underwood, A.L. Quantitative Analysis, Prentice Hall of India

	Gurudeep R Chatwal, Sham K Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House.
	Barrow, G.M. Physical Chemistry Tata McGraw Hill (2007).

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **First Year BSc (Chemistry) Semester-II** **Vertical : DSC** **Course Code: G04-0202-P** **Course Name: Chemistry-II-Practical Lab-II**
***Teaching Scheme** **Practical:04Hours/week, 02Credit**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Chemistry II practical is one of the core courses in the Chemistry curriculum. This course provides an in-depth understanding of the fundamental concepts in Organic and Analytical Chemistry. By combining theoretical knowledge with hands on practical will helps students to develop practical skills in analyzing and optimizing the Organic and Analytical Chemistry concepts.

	Course Objectives:
●	To know the steps involved in organic compound identification
●	To understand the type of organic compound
●	To know about chromatography
●	To understand the estimation process
	Course Outcomes COs
	The students will able to
●	Identify the given organic compound by performing systematic analysis
●	Prepare various derivatives of the organic compounds
●	Estimate typical organic compounds
●	Separate and identify the inorganic metal ions using chromatography technique

•	Determine viscosity and refractive index of given liquids
	List of Experiments
Sr. No.	**Name of the Practical**
	Organic Chemistry Organic Qualitative Analysis.
	Identification of at least four organic compounds with reactions including at least one from acids, phenols, bases and neutrals from the list of the compounds given below- • Acids : Oxalic acid, Benzoic acid and Cinnamic acid • Phenols : β - Naphthol, Resorcinol. • Bases : Aniline, p - Toluidine. • 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) Comparison with literature 6) ConfirmatoryTest 7) Summary **8)** Result
	Organic Preparation: (Any one)
	i) Preparation of benzoic acid from benzamide. ii) Preparation of dibenzal acetone from benzaldehyde and acetone. (Wt. of crude product is expected. M.P. of the recrystallized product is not expected.)
	Analytical Chemistry • Determination of viscosity of given liquids A and B. (Density data of liquids,viscosity of water to be given.) [Any two liquids from, Acetone, CCl_4, Ethyl alcohol, Ethylene glycol and n-propyl alcohol] • Determination of refractive index and specific refraction of given liquids.[Any two liquids from,CCl_4, $CHCl_3$, benzene, xylene, toluene, ethyl alcohol]
	Estimations:(any one) i) Estimation of aniline ii) Estimation of acetamide iii) Estimation of Aspirin **Qualitative Analysis:** • Spot Tests: Detection of following cations using spot tests:

	Cu^{2+},Co^{2+},Ni^{2+},Fe^{3+},Zn^{2+},Mg^{2+}, Al^{3+},Pb^{2+}. • Chromatography: Separation and identification of cations by Paper Chromatographic technique from the following mixtures : • Ni^{2+}+Cu^{2+} • Ni^{2+}+Co^{2+} • Cu^{2+} +Co^{2+}
	Reference Books:
1.	Experiments in Chemistry: D.V. Jahagirdar
2.	Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
3.	Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar
4.	Handbook of Organic Qualitative Analysis: Clarke
5.	Comprehensive Practical Organic Chemistry- Quantitative Analysis by V.K. Ahluwalia, Sunita Dhingra, University Press. Distributor - Orient LongmanLtd.,
6.	Comprehensive Practical Organic Chemistry preparation and Quantitative Analysis.: V.K. Ahluwalia, Renu Agarwal, University Press. Distributor-OrientLongmanLtd.,
7.	A laboratory Hand-Book of organic Qualitative Analysis and separation: V. S. Kulkarni, Dastane Ramchandra and Co.Pune.

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year BSc (Chemistry) Semester-I** **Vertical : GE/OE** **Course Code: G04-GE-OE-202** **Course Name: Chemistry-GE/OE-II (Chemistry in Daily Life)**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Chemistry I practical is one of the core courses in the Chemistry curriculum. This course provides an in-depth understanding of the fundamental concepts in Physical and Inorganic chemistry. By combining theoretical knowledge with hands on practicals will helps students to develop practical skills in analyzing and optimizing the Physical and Inorganic Chemistry concepts.

	Course Objectives:
•	To know the household chemicals
•	To understand the chemistry of cosmetics
•	To know various methods of food processing and preservation
•	To understand the adulteration in food
	Course Outcomes:
•	CO1: Understand the chemical constituents in various day to day materials used by a common man like Tooth paste, Cosmetics, Soaps and detergents and Biomolecules
•	CO2: Understand the chemical constituents and applications in Food additives, adulterants and contaminants, Artificial food colorants**.**
•	CO3: Understand the scientific reasons in various aspects and chemotherapy and its applications.
•	CO4: Understand the chemical constituents and applications used in kitchen.
•	CO5: Understand the importance of chemistry in daily life
Unit I	**Hrs (15) Weightage: 23 Marks**
1.1	**Household chemicals**: Common chemicals used at home.
1.2	**Tooth paste** – Contents of toothpaste, chemical name, ingredients, flavor and its role. **Cosmetics** – Contents and uses of Face powder, snow, lipsticks and perfumes. Toxic household chemicals and their effects (antifreeze, bleach, drain cleaners, carpet cleaners, ammonia, air fresheners).
1.3	**Dairy Products**: Composition of milk and milk products. Analysis of fat content, minerals in milk and butter. Estimation of added water in milk.
1.4	**Beverages**: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate, estimation of methyl alcohol in alcoholic beverages.
Unit II	**Hrs (15) Weightage: 23 Marks**
2.1	**Analysis of food products** : Adulteration, Identification of adulterants in some common food items like milk, coffee powder, chilli powder, turmeric powder, coriander powder, pulses.
2.2	**Food Processing and Preservation** - Food coloring agents (permitted and non permitted), flavoring agents, Additives; viscosity builders, bulking agents, artificial sweeteners (Aspartame, saccharin, sucralose, and sodium cyclamate).
	Reference books:
1.	Chemistry In Daily Life by Kirpal Singh [3rd Edition], PHI Learning
2.	Childs, P. E. (1986). What is everyday chemistry?
3.	The Chemistry of Food; Jan Velisek; Willey Blackwell, 2014
4.	Analysis of Foods - H.E. Cox: 13. Chemidabi Analysis of Foods - H.E.Cox and pearson.

5.	Foods: Facts and Principles. N. Shakuntala Many and S. Swamy, 4th ed. New Age International (1998)

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **First Year BSc (Chemistry) Semester-I** **Vertical : SEC** **Course Code: G04-SEC-202** **Course Name: Chemistry-SEC-I (Fertilizer and Food Analysis)**
***Teaching Scheme** **Practical:04 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

Course Preamble: Chemistry-SEC-I (Fertilizer and Food Analysis) is one of the skill enhancement course in the Chemistry curriculum. This course provides practical skills in fertilizer and food analysis. Students will able to identify the adultrations done in fertilizers and food. By combining theoretical knowledge with hands on practicals will helps students to develop practical skills.

	Learning Objectives:
	Students will be able to-
●	create awareness among students in understanding the basic of analysis
●	ability to do analysis of soil and water samples
●	encourage student for self-employment.
●	ensure the quality of water and soil
	List of Experiments
Sr. No.	**Name of the Practical (Any Eight practical)**
A	**Food and Fertilizer analysis**
1	Estimation of sodium benzoate
2	Estimation of carbohydrate
3	Estimation of sweeteners
4	Identification of hydrocolloids
5	Estimation of other food additives
6	Quantitative estimation of protein
7	Iodine estimation from salt
8	Quantitative estimation of anti-nutritional factors

10	Estimation of contaminants
11	Food adulteration
12	Hardness of Water
13	Acidity of milk/lassi
14	Estimation of Vitamin C
15	Vinegar sample analysis
16	Fertilizer samples analysis
17	Estimation of amount of Sodium from the given fertilizer sample by cation exchange method
18	Estimation of amount of Magnesium and Zinc from the given fertilizer sample by anion exchange method
19	Estimation of amount of Aluminium form Potash ion volumetric method
	Reference Books:
1	The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists, by Connie M. Weaver (Author), James R. Daniel
2	IFT Experiments in Food Science Series : Food Chemistry Experiments, Institute of Food Technologists The Society for Food Science and Technology 221 N. LaSalle St., Suite 300, Chicago, IL 60601
3	Owen R Fennema's (2008) Food Chemistry 4th Edition, CRC Press Publishers.
4	Manual of Methods of Analysis Of Food Additives: Food Safety And Standards Authority of India Ministry Of Health And Family Welfare Government of India New Delhi 2016.
5	A practical book on soil, plant, water and fertilizer analysis by Sarveshkumar Debey and Asha Arora
6	Practical manual for analysis of soil, water, fertilizer and manure by Javed Ahmad Sofi, S. A. Bangroo and M. A. Chesti
7	Fertilizers, soil analysis and plant nutrition by D. R. Hoagland

	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year BSc (Chemistry) Semester-I** **Vertical : AEC** **Course Code: ENG-201** **Course Name: English for Communication-Paper-II**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **First Year BSc (Chemistry) Semester-I** **Vertical : VEC** **Course Code: ENS24** **Course Name: Environmental Studies**
***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

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***Teaching Scheme** **Lectures:02 Hours/week, 02 Credits**	***Examination Scheme** **UA:30 Marks** **CA: 20 Marks**

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UA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B. Sc. (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 30

Instructions

1) All Questions are compulsory

2) Figure to right indicate full marks.

Q.1 Choose correct alternative. (MCQ) 06 Marks

1)

a) b) c) d)

2)

a) b) c) d)

3)

a) b) c) d)

4)

a) b) c) d)

5)

a) b) c) d)

6)

a) b) c) d)

Q.2. Answer the following. (Any three) 6 (2+2+2)

A)

B)

C)

D)

E)

Q.3. Answer the following (Any two). 6 (3+3)

A)

B)

C)

Q.4. Answer the following (Any two). 6 (3+3)

A)

B)

C)

Q.5. Answer the following (Any one). 6 Marks

A)

B)

CA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B. Sc. (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 20

- **Internal Evaluation System for 20 Marks**
  - Choose any two of the following
  - Home Assignment / Unit Test / Tutorial /Seminar

- **Pattern of Examination:**
  - External Evaluation + Internal Evaluation
  - 30 Marks + 20 Marks = 50 Marks
- **Passing Criteria:**
  - Written Exam – 12 out of 30
  - Continuous Assessment (CA) – 08 out of 20
