

**Shri Rawatpura Sarkar University,
Raipur**



Examination Scheme & Syllabus
for
**Bachelor of Science in Environmental
Science**
Semester-I

(Effective from the session: 2022-23)



Faculty of Science,
Shri Rawatpura Sarkar University, Raipur
Bachelor of Science in Environmental Science
Semester-I
Examination Scheme
(Effective from the session: 2022-23)

S. No	Course Code	Th/Pr	Subject	Type of Course	Teaching hours per week			TC	Examination Scheme				Total Marks
					L	T	P		Theory		Practical		
									SE*	CA**	SE*	CA**	
1	SSH04101	Th	Earth And Earth Surface Processes	Core	4	-	-	4	70	30	-	-	100
2	SSH04102	Th	Land and Soil Conservation and Management	Core	4	-	-	4	70	30	-	-	100
3	SSH04103	Th	Chemistry I: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons	Core	4	-	-	4	70	30	-	-	100
4	SSH04112	Th	English language/MIL	AECC	4	-	-	4	70	30	-	-	100
5	SSH04181	Pr	Environmental Lab Course: I	Core	-	-	4	2	-	-	35	15	50
6	SSH04182	Pr	Environmental Lab Course: I	Core	-	-	4	2	-	-	35	15	50
7	SSH04183	Pr	Chemistry: Lab Course: I	Core	-	-	4	2	-	-	35	15	50
Total								22					550

* Semester Examination, ** Continuation Assessments



Bachelor of Science in Environmental Science
Semester-I
2022-2023

Course Title	Earth And Earth Surface Processes				
Course Code	SSH04101				
Course Credits	L	T	P	TC	
	4	-	-	4	
Prerequisites	Basic knowledge of environment				
Course Objectives	<ul style="list-style-type: none"> The paper will introduce students to the basic structure and composition of the Earth and will explore various surface processes and their impact on and role in living systems. It will also deal with the interactive processes in the inner as well as outer Earth's surface 				
Course Contents	<p>UNIT -I</p> <p>History of Earth: Solar system formation and planetary differentiation; formation of the Earth: formation and composition of core, mantle, crust, atmosphere and hydrosphere; chemical composition of Earth; geological time scale and major changes on the Earth's surface; Holocene and the emergence of humans, role of humans in shaping landscapes; development of cultural landscapes.</p> <p>UNIT -II</p> <p>Earth system processes: Movement of lithosphere plates; mantle convection and plate tectonics, major plates and hot spots, plate boundaries; sea floor spread; earthquakes; volcanic activities; orogeny; isostasy; gravitational and magnetic fields of the earth; origin of the main geomagnetic field; continental drift, Pangaea and present-day continents, paleontological evidences of plate tectonics; continental collision and mountain formation with specific example of the Himalaya</p> <p>UNIT -III</p> <p>Minerals and rocks: Minerals and important rock forming minerals; rock cycle: lithification and metamorphism; Three rock laws; rock structure, igneous, sedimentary and metamorphic rocks; weathering: physical, biogeochemical processes; erosion: physical processes of erosion, factors affecting erosion; agents of erosion: rivers and streams glacial and aeolian transportation and deposition of sediments by running water, wind and glaciers</p> <p>UNIT- IV</p> <p>Earth surface : Atmosphere Evolution of earth's atmosphere, composition of atmosphere, physical and optical properties, circulation; interfaces: atmosphere-ocean interface, atmosphere-land interface, ocean-land interface; land surface processes: fluvial and glacial processes, rivers and geomorphology; types of glaciers, glacier dynamics, erosional and depositional processes and glaciated landscapes; coastal processes.</p> <p>UNIT -V</p>				



Bachelor of Science in Environmental Science
Semester-I
2022-2023

	<p>Importance of being a mountain : Formation of Peninsular Indian mountain systems - Western and Eastern Ghats, Vindhyas, Aravallis, etc. Formation of the Himalaya; development of glaciers, perennial river systems and evolution of monsoon in Indian subcontinent; formation of Indo-Gangetic Plains, arrival of humans; evolution of Indus Valley civilization; progression of agriculture in the Indian subcontinent in Holocene; withdrawing monsoon and lessons to draw.</p>
Course Outcomes	<ul style="list-style-type: none">• Students will understand the structures and purposes of basic components, structure and composition of the Earth
Text Books	<ol style="list-style-type: none">1. Bridge, J., & Demicco, R. 2008. Earth Surface Processes, Landforms and Sediment deposits. Cambridge University Press.2. Duff, P. M. D., & Duff, D. (Eds.). 1993. Holmes' Principles of Physical Geology. Taylor & Francis.3. Gupta, A. K., Anderson, D. M., & Over peck, J. T. 2003. Abrupt changes in the Asian southwest monsoon during the Holocene and their links to the North Atlantic Ocean. Nature 421: 354-357.4. Leeder, M., Arlucea, M.P. 2005. Physical Processes in Earth and Environmental Sciences. Blackwell Publishing. Press. Chicago
Reference Books	<ol style="list-style-type: none">1. Keller, E.A. 2011. Introduction to Environmental Geology (5th edition). Pearson Prentice Hall.2. Krishnan, M. S. 1982. Geology of India and Burma. CBS Publishers & Distributors3. Pelletier, J. D. 2008. Quantitative Modeling of Earth Surface Processes (Vol. 304). Cambridge: Cambridge University4. Gupta, A. K., Anderson, D. M., Pandey, D. N., & Singhvi, A. K. 2006.5. Adaptation and human migration of agriculture coincident with changes in the Indian summer monsoon during the Holocene. Current Science 90: 1082-1090.



Bachelor of Science in Environmental Science
Semester-I
2022-2023

Course Title	Land and Soil Conservation and Management				
Course Code	SSH04102				
Course Credits	L	T	P	TC	
	4	-	-	4	
Prerequisites	Basic knowledge of environment				
Course Objectives	<ul style="list-style-type: none"> This paper introduces students to the fundamentals of land and soil degradation. Each unit covers a range of topics, which will help students develop basic understanding of properties of soil and how the quality of land and soil degrades due to anthropogenic activities. 				
Course Contents	<p>UNIT -I Introduction: Land as a resource, soil health; ecological and economic importance of soil; types and causes of soil degradation; impact of soil loss and soil degradation on agriculture and food security; need for soil conservation and restoration of soil fertility.</p> <p>UNIT -II Fundamentals of soil science: Soil formation; classification of soil; soil architecture; physical properties of soil; soil texture; soil water holding capacity; soil temperature; soil colloids; soil acidity and alkalinity; soil salinity and sodicity; soil organic matter; micronutrients of soil; nitrogen, sulphur, potassium and phosphorus economy of soil; soil biodiversity; soil taxonomy maps.</p> <p>UNIT -III Soil degradation: causes Soil resistance and resilience; nature and types of soil erosion; non-erosive and erosive soil degradation; losses of soil moisture and its regulation; nutrient depletion; soil pollution due to mining and mineral extraction, industrial and urban development, toxic organic chemicals, and organic contaminants in soils; fertilizers and fertilizer management; recycling of soil nutrients.</p> <p>UNIT -IV Land use changes and land degradation: Land resources: types and evaluation; biological and physical phenomena in land degradation; visual indicators of land degradation; drivers of land degradation - deforestation, desertification; habitat loss, loss of biodiversity; range land degradation; land salinization; human population pressure, poverty, socio-economic and institutional factors; drivers of land use and land cover change in major geographic zones and biodiverse regions with particular reference to the Himalaya and the Western Ghats.</p> <p>UNIT- V Costs of land degradation Economic valuation of land degradation; onsite and offsite costs of land degradation; loss of ecosystem services; effects on farming</p>				



Bachelor of Science in Environmental Science
Semester-I
2022-2023

	communities; effects on food security; effects on nutrient cycles; future effects of soil degradation; emerging threats of land degradation to developing countries. Controlling land degradation; Sustainable land use planning; role of databases and data analysis in land use planning control and management; land tenure and land policy; legal, institutional and sociological factors; participatory land degradation assessment; integrating land degradation assessment into conservation.
Course Outcomes	<ul style="list-style-type: none">• Students understand the fundamentals of land and soil degradation due to anthropogenic activities.
Text Books	<ol style="list-style-type: none">1. Brady, N.C. & Well, R.R. 2007. The Nature and Properties of Soils (13th edition), Pearson Education Inc.2. Gadgil, M. 1993. Biodiversity and India's degraded lands. <i>Ambio</i> 22: 167-172.3. Johnson, D.L. 2006. Land Degradation (2nd edition). Rowman & Littlefield Publishers.4. Marsh, W. M. & Dozier. 1983. Landscape Planning: Environmental Applications. John Wiley and Sons.
Reference Books	<ol style="list-style-type: none">1. Sodhi, N.S., Gibson, L. & Raven, P.H. Conservation Biology: Voices from the Tropics. pp. 123-133. Wiley-Blackwell, Oxford, UK2. Peterson, G. D., Cumming, G. S. & Carpenter, S. R. 2003. Scenario planning: a tool for conservation in an uncertain world. <i>Conservation Biology</i> 17: 358-366.3. Scherr, S. J. 1999. Soil degradation: A threat to developing-country food security by 2020? (Vol. 27). International Food Policy Research Institute.4. Oldeman, L. R. 1994. The global extent of soil degradation. Soil resilience and sustainable land use, 9. (http://library.wur.nl/isric/fulltext/isricu_i26803_001.pdf).5. Pandit, M.K. et. al. 2007. Unreported yet massive deforestation driving loss of endemic biodiversity in Indian Himalaya. <i>Biodiversity Conservation</i> 16: 153-163.6. Pandit, M.K. & Kumar, V. 2013. Land use and conservation challenges in Himalaya: Past, present and future. In:



Bachelor of Science in Environmental Science
Semester-I
2022-2023

Course Title	CHEMISTRY I: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS			
Course Code	BSCCH102A			
Course Credits	L	T	P	TC
	4	-	-	4
Prerequisites	BASIC ORGANIC CHEMISTRY			
Course Objectives	<ul style="list-style-type: none"> Understand the basic knowledge of atomic structure, bonding, general chemistry and aliphatic hydrocarbon 			
Course Contents	<p>UNIT I</p> <p>ATOMIC STRUCTURE:-Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure, What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m and m_s. Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (m_s).</p> <p>UNIT II</p> <p>CHEMICAL BONDING AND MOLECULAR STRUCTURE:-Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character, Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds, MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and</p>			



Bachelor of Science in Environmental Science
Semester-I
2022-2023

	<p>NO+. Comparison of VB and MO approaches.</p> <p>UNIT III</p> <p>FUNDAMENTALS OF ORGANIC CHEMISTRY:-Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis, Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals, Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.</p> <p>UNIT IV</p> <p>STEREOCHEMISTRY:-Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis- trans nomenclature; CIP Rules: R/ S (for up to 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).</p> <p>UNIT V</p> <p>ALIPHATIC HYDROCARBONS:-Alkanes: (Up to 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO₄) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation. Alkynes: (Up to 5 Carbons) Preparation: Acetylene from CaC₂ and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO₄, ozonolysis and oxidation with hot alk. KMnO₄.</p>
Course Outcomes	<p>CO1 :to understand the basics quantum mechanics,</p> <p>CO2: to gain the knowledge of Ionic and covalent bonding and</p> <p>CO3: to gain the knowledge of fundamental of organic chemistry</p> <p>CO4: to understand the stereochemistry organic compounds.</p> <p>CO5: to understand the preparation of aliphatic hydrocarbons</p>
Text Books	<p>1. Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. Organic Chemistry, John Wiley & Sons (2014).</p> <p>2. McCurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.</p>



Bachelor of Science in Environmental Science
Semester-I
2022-2023

References Books	<ol style="list-style-type: none">1. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.2. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988). <p style="text-align: center;">Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.</p>
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Course Title	English Language								
Course Code	SSH04112								
Course Credits	<table border="1" style="display: inline-table;"><tr><td>L</td><td>T</td><td>P</td><td>TC</td></tr><tr><td>4</td><td>-</td><td>-</td><td>4</td></tr></table>	L	T	P	TC	4	-	-	4
	L	T	P	TC					
4	-	-	4						
Prerequisites	Basic knowledge of English								
Course Objectives	Upon completion of the course the student shall be able to <ol style="list-style-type: none">1. Communicate effectively (Verbal and Non Verbal)2. Effectively manage the team as a team player3. Develop interview skills								
Course Contents	<p>UNIT I</p> <p>Key Concepts: Process and Elements of Communication: context of communication; the speaker/writer and the listener/reader; Medium of communication; Principles of communication (7 C's of communication); Barriers in communication, effective communication; Communication in organization.</p> <p>UNIT II</p> <p>Writing: Selecting material for expository, descriptive, and argumentative pieces; Resume; covering letter, Elements of letter writing and style of writing, business letters: Quotation and Tenders; Basics of Informal and Formal Reports-technical report writing, lab report; Précis writing.</p> <p>UNIT III</p> <p>Reading: Effective Reading; reading different kinds of texts for different purposes; reading between the lines. Comprehension of Unseen Passages. Grammar in use: Errors of Accidence and syntax with reference to Parts of Speech; Agreement of Subject and Verb; Tense and Concord; Use of connectives, Question tags. Voice and Narration. Indianism in English: Punctuation and Vocabulary, Building (Antonym, Synonym, Verbal Analogy and One Word Substitution).</p> <p>UNIT IV</p> <p>Speaking: Achieving desired clarity and fluency; effective speaking; task-oriented, inter-personal, informal and semi-formal speaking Meetings, Seminar,</p>								



Bachelor of Science in Environmental Science
Semester-I
2022-2023

	Conferences, Interviews, Presentation, Audio-visual communication. UNIT V Listening: Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English and American English; Intelligent listening in situations. Advantages of listening. Hearing and Listening; Essentials of Good Listening. Use of Modern Communication Devices; Telephonic Conversation.
Course Outcomes	<ul style="list-style-type: none">• On the completion of this course successfully student will be able to understand the subject through the real essence of English language also.
Text Books	<ol style="list-style-type: none">1. Sharma RC & Mohan K – "Business Corresponding and Report Writing", Tata McGraw Hill, New Delhi, 1994.2. Alok Jain, P S Bhatia & A M Shiekh – "Professional Communication Skills; S. Chand & Company Ltd. 2005.3. Rajendra Pal and JS Korlahalli – "Essentials of Business Communication", Sultan Chand & Sons, 1997.4. A guide to Correct English – Oxford University Press, Ely House, London W.I., Latest Edition. (For UNIT III)5. Fiske, John – "Introduction to Communication Studies", Rotledge London, 1990.
References Books	<ol style="list-style-type: none">1. Geoffrey Leech & Jan Svartvik – "A Communicative Grammar of English", ELBS Longman, England.2. Bill Scott – "The Skills of Communicating", Jaico Publishing House, Mumbai, 2004.3. Gartside L- "Model Business Letters", Pitman, London, 1992.4. Krishna Mohan & N. P. Singh – "Speaking English Effectively"; MacMillan India, New Delhi; 2001.5. 100 Tests in VOCABULARY; Indian Institute of Publishing, Chennai



Bachelor of Science in Environmental Science
Semester-I
2022-2023

Course Title	Environmental Lab Course: I				
Course Code	SSH04181				
Course Credits	L	T	P	TC	
	2	-	-	2	
Prerequisites	Preliminary theoretical knowledge of earth Surface				
Course Objectives	<ul style="list-style-type: none">○ Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.○ Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.				
Course Contents	<ol style="list-style-type: none">1. Temporary wet amount technique for the observation of living organism.2. Ecological comments on charts/material/fresh plant material (as per syllabus).3. Comments on economic uses of plant material (as per syllabus).4. Preparation of field report based on the survey of local flora.5. Study of centre of diversity of plants from maps.6. Comments on life cycle of some economically important insects.7. Identification of museum specimens of some economically important fishes.8. Describe the environmental problem of your locality and suggest a remedy				
Course Outcomes	<ul style="list-style-type: none">• After the practical course, students will be able to differentiate the cells of various living organisms and get awareness of ecosystem, biodiversity, wildlife. Students will be able to observe and correctly identify different				
Text books	<ol style="list-style-type: none">1. Masters, G.M. Introduction to Environment Engineering and Science (Prentice Hall of India).				
References books	<ol style="list-style-type: none">1. Environmental Chemistry by A.K. Dey (Eastern Ltd.)				



Bachelor of Science in Environmental Science
Semester-I
2022-2023

Course Title	Environmental Lab Course: II				
Course Code	SSH04182				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	Preliminary theoretical knowledge				
Course Objectives	<ul style="list-style-type: none">• To enable the students to develop skills in qualitative and quantitative analysis.• Appreciate the interrelationship between living and non-living components of our environment.• Understand the impact of human activities on the local environment.• Understand Soil pollution and its harmful effect on the environment and devise strategies for reducing pollution.				
Course Contents	<ol style="list-style-type: none">1. Quantitative analysis of soil organic carbon.2. Quantitative analysis of soil pH.3. To study pore space, water holding capacity and bulk density of soil.4. Identification of rocks and minerals on the basis of physical character.5. To determine the nitrogen(N) content in given soil sample.6. To determine the Phosphorous(P) content in given soil sample.7. To determine the potassium(K) content in given soil sample.8. To determine the acidity of given soil sample.9. To determine the alkalinity in given soil sample.10. To determine the conductivity and turbidity in given soil sample.				
Course Outcomes	<ul style="list-style-type: none">• After the practical course, students will be able to differentiate the cells of various living organisms and get awareness of ecosystem, soil types. Students will be able to observe and correctly identify different				
Textbooks	<ol style="list-style-type: none">1. Masters, G.M. Introduction to Environment Engineering and Science (Prentice Hall of India).				
Reference Books	<ol style="list-style-type: none">1. Environmental Chemistry by A.K. Dey (Eastern Ltd.)				



Bachelor of Science in Environmental Science
Semester-I
2022-2023

Course Code	BSCEV108P			
Course Credits	L	T	P	TC
	-	-	4	4
Prerequisites	Chemistry I Theory			
Course Objectives	<ul style="list-style-type: none"> To enable the students to develop skills in inorganic, physical and organic chemistry. 			
Course Contents	<p>Perform Any Ten Experiments</p> <p>Section A: Inorganic Chemistry</p> <ol style="list-style-type: none"> 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with KMnO_4. 3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4. 4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator. 5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$. 6. To identify two acid radicals (including interfering) and two basic radicals in a given inorganic mixture. <p>Section B :Organic Chemistry</p> <ol style="list-style-type: none"> 1. Detection of extra elements (N,S,Cl,Br,I) inorganic compounds(containing upto two extra elements) 2. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given) <ol style="list-style-type: none"> (a) Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography (b) Identify and separate the sugars present in the given mixture by paper chromatography. 1. Purification of organic compounds by crystallization (from water and alcohol) and distillation. 2. Criteria of Purity: Determination of melting and boilingpoints. 3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done. <ol style="list-style-type: none"> (a) Bromination of Phenol/Aniline 			



Bachelor of Science in Environmental Science
Semester-I
2022-2023

	<p>(b) Benzoylation of amines/phenols</p> <p>(c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone</p> <p>4. To identify the functional group in a given organic compound.</p>
Course Outcomes	On the completion of this course successfully, student will be able to volumetric analysis, physical parameters of drink, soap and preparation of organic molecules and determination of purity.
Text Books	1. 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.
Reference Books	<ol style="list-style-type: none">1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.2. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.