



# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Shri Vaishnav Institute of Science Department of Life Science B.Sc. (Major - Biotechnology)

### SEMESTER I

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
<b>BSCBT101</b>	<b>Major</b>	<b>Biomolecules and Metabolism</b>	60	20	20	30	20	4	-	4	6

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

**\*Teacher Assessment shall be based following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.**

### Course Objectives:-

1. Conferring basic knowledge about structure and functions of biomolecules
2. Understanding of how enzymes and metabolites in the living system work to synthesize different biomolecules and produce energy.
3. Comprehensive knowledge about biochemical pathways involved in intermediary metabolism and regulation of carbohydrate, protein, lipid, and nucleic acid.

### Course Outcomes:-

1. An understanding of structural and functional fundamentals of carbohydrate, protein, lipid, and nucleic acid.
2. Understanding of the major metabolic processes in the living system.
3. Understanding the mechanism and the importance of enzymes.

### **Unit - I: Chemical composition of living matter. Properties of water and aqueous environment**


Carbohydrates: Stereoisomerisms and classification of monosaccharaides. Di, tri and polysaccharides, their functions in energy storage and cell structure; Glyco-conjugates; glycoproteins, proteoglycans and glycolipids.


Lipids: Structure of fatty acids and complex lipids. Functions of complex lipids as components of membrane and storage molecules; Structure and functions of Terpenes and steroids


### **Unit – II: Amino acids: Structure, properties and classification**


Proteins: primary, secondary, tertiary and quaternary structure; Ramchandran plot and Protein folding.

Nucleic acids: Structure and properties of DNA and RNA; A, B and Z form of DNA.

  
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## Shri Vaishnav Institute of Science Department of Life Science B.Sc. (Major - Biotechnology)

### BSCBT101 Biomolecules and Metabolism

**Unit – III:** Enzymes – nomenclature and classification. Enzyme kinetics and enzyme inhibition; Regulatory enzymes

Vitamins and co-enzymes: Structure, regulation of biochemical reactions and function of water soluble vitamins; Fat soluble Vitamins A, D, E and K.

**Unit – IV:** Glycolysis, citric acid cycle and energy generation; Pentose phosphate pathway and its regulation. Gluconeogenesis, glycogenesis and glycogenolysis, glyoxylate and Gamma aminobutyrate shunt pathways, Cori cycle, Entner-Doudoroff pathway, glucuronate pathway.

Lipid Metabolism: biosynthetic pathway for triacylglycerols, phosphoglycerides, sphingomyelin and prostaglandins. Hydrolysis of triacylglycerols and oxidation of fatty acids. Metabolism of cholesterol and its regulation. Ketone bodies biosynthesis.


**Unit - V:** Protein metabolism: Synthesis and degradation of amino acids – transamination and deamination reactions. Urea cycle and metabolic disorders; metabolism and regulation of cholesterol; biosynthesis of ketone bodies


#### List of Practical

1. Estimation of Saponification value of fat
2. Determination of acid value of fat
3. Separation of leaf fragments by paper chromatography
4. Quantitative estimation of Nucleic acid
5. Qualitative estimation of Carbohydrate by Benedict's Test
6. Qualitative estimation of Carbohydrate by Barfoed's Test
7. Qualitative estimation of Protein by Xanthoproteic test
8. Qualitative estimation of Protein by Sakaguchi test
9. Qualitative estimation of Lipid by Saponification test:
10. Qualitative estimation of Lipid by Dichromate Test


#### Books:

1. Donald Voet, Judith G. Voet, Charlotte W. Pratt (2018). Voet's Principles of Biochemistry (5th Edi), Wiley
2. David L. Nelson, Michael M. Cox (2021). Lehninger Principles of Biochemistry ( 8thEd.), W H Freeman & Co
3. Lubert Stryer, Jeremy M. Berg, John L. Tymoczko, Gregory J. Gatto Jr. (2019) Biochemistry( 9<sup>th</sup> Ed. )– W. H. Freeman & Co.
4. Zubey G. L. Parson. W. W. (1995) Principles of Biochemistry - Brown (William C.) Co, U.S.

  
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<b>BSCCH101</b>	<b>Minor</b>	<b>Inorganic Chemistry I</b>	60	20	20	30	20	4	0	4	6

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### Course Educational Objectives (CEOs):

The subject aims to provide the student with:

1. To understand the periodic law and significance of atomic no and electronic configuration as the basic for periodic classification.
2. To include the importance of different types and theories of chemical bonding.
3. To understand different properties and reactions of the compounds of s- and p- block elements.
4. To acquire required knowledge about coordination compounds and different theories of complexes.
5. To acquaint the students with practical knowledge of the concepts of inorganic chemistry.

### Course Outcomes (COs):


1. Students will gain the basic knowledge of periodic law and significance of atomic no and electronic configuration as the basic for periodic classification and able to classify elements into s, p, d and f blocks.
2. They learn the importance of different types of chemical bonding in terms of the attainment of a stable electronic structure.
3. They will be able to understand the properties of s- and p- block elements and their compounds.
4. Students will be able to explain the fundamental concepts in coordination chemistry.
5. They can predict potential applications of inorganic chemistry and practical utility to become good chemist.


### Syllabus

#### Unit – 1


#### Atomic structure:

Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: de Broglie equation, Heisenberg's uncertainty principle, and its significance. Schrödinger's wave equation, significance of  $\psi$  and  $\psi^2$ . Quantum numbers and their significance. Normalized and

  
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### BSCCH101 Inorganic Chemistry I

orthogonal wave functions. Radial and angular distribution curves. Shapes of s, p, and d orbitals. Pauli's Exclusion Principle, Hund's rule of maximum spin multiplicity, Aufbau principle and its limitations.

#### Unit - 2

##### Periodic properties of elements:

Brief discussion of the following properties of the elements and the trends shown:

- Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.
- Atomic and ionic radii.
- Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization enthalpy and trends in groups and periods.
- Electron gain enthalpy and trends in groups and periods.
- Electronegativity, Pauling's/ Allred Rochow's scales. Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity.

#### Unit - 3

##### Chemical bonding:

**Ionic bond:** General characteristics, radius ratio rule and its limitations. Born-Landé equation and Kapustinskii equation for lattice energy. Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization.

**Covalent bond:** Valence Bond theory and its limitations. Types of hybridization with examples. Valence shell electron pair repulsion (VSEPR) theory, shapes of some inorganic molecules based on VSEPR ( $\text{H}_2\text{O}$ ,  $\text{NH}_3$ ,  $\text{PCl}_5$ ,  $\text{SF}_4$ ,  $\text{SF}_6$ ,  $\text{ClF}_3$ ,  $\text{ICl}_4^-$ ). Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules  $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{F}_2$ ,  $\text{CO}$  and  $\text{NO}$ .

**Weak Chemical Forces:** van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interaction, Hydrogen bonding.


#### Unit-4


##### Chemistry of s and p block elements:

Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen, and water. Common features such as ease of formation, thermal stability and solubility of the following alkali and alkaline earth metal compounds: hydrides, oxides, peroxides, superoxides, carbonates, nitrates, sulphates.


Catenation, Allotropy of C, P, S; inert pair effect, diagonal relationship between B and Si and anomalous behaviour of first member of each group. Hydrides and their classification ionic, covalent, and interstitial. Study of the following compounds with emphasis on structure, bonding, preparation, properties and uses:

Boric acid and borates, borohydrides (diborane), carboranes, silanes, oxides and oxoacids of nitrogen, phosphorus, and chlorine. Interhalogen compounds. Pseudohalogens.

  
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## Shri Vaishnav Institute of Science Department of Life Science B.Sc. (Major - Biotechnology)

### BSCCH101 Inorganic Chemistry I

#### Unit-5

#### Coordination compounds

Werner's coordination theory and its experimental verification, IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. A brief idea about chelate effect and labile and inert complexes. Valence bond theory and its application to complexes of coordination numbers 4 and 6.


Examples of inner and outer orbital complexes. Crystal field theory, Crystal field splitting in octahedral, tetrahedral, and square planar complexes. Factors affecting the crystal-field parameters.


#### References:


1. Huheey, J.E.; Keiter, E.A.; Keiter, R. L.; Medhi, O.K., Inorganic Chemistry- Principles of Structure and Reactivity, Pearson Education.
2. Lee, J.D. Concise Inorganic Chemistry, ELBS.
3. Atkins, P.W.; Overton, T.L.; Rourke, J.P.; Weller, M.T.; Armstrong, F.A., Shriver and Atkins Inorganic Chemistry, 5th Edition, Oxford University Press.
4. Cotton, F.A.; Wilkinson, G., Advanced Inorganic Chemistry Wiley-VCH.
5. Sodhi, G.S., Principles of Inorganic Chemistry, Viva books.
6. Garg, R., Singh, R., Inorganic Chemistry, McGraw Hill Education.


#### List of Experiments:

1. Calibration and uses of different apparatus and glasswares.
2. Preparation and standardization of solutions of different Molarity/Normality.
3. Preparation of stock solutions of different Molarity/Normality.
4. Inorganic Preparations. (Compound 1)
5. Inorganic Preparations. (Compound 2)
6. Inorganic Preparations. (Compound 2)
7. Determination of the strength of given unknown oxalic acid solution by titrating it against Potassium permanganate.
8. Estimation of free alkali present in different soaps/detergents.
9. An analysis of a mixture of  $\text{Na}_2\text{CO}_3$  and  $\text{NaOH}$  using two indicators and a standard  $\text{HCl}$  solution.
10. Preparation of colloidal solution of starch.

  
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**Choice Based Credit System (CBCS) in Light of NEP-2020**  
**Ability Enhancement Course (AEC)**  
**Semester I & II (Batch 2022-26)**

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ENG101	AEC	Foundation English	60	20	20	-	-	4	0	0	4

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**Course Educational Objectives (CEOs): The students will**

- CEO 1 Understand the different nuances of communication.
- CEO2 understand the features of listening and reading skills.
- CEO3 Comprehend the factors that influence use of grammar and vocabulary in speech and writing
- CEO4 study the essential aspects of effective written communication through Business letters and email writing for professional success.
- CEO5 Develop competency in professional communication.

**Course Outcomes (COs): The students will be able to**

- CO1 develop a comprehensive understanding of the theoretical and practical aspects of communication.
- CO2 understand and the different aspects of listening and reading.
- CO3 Apply grammatical rules in speech and writing.
- CO4 Use proper formats of written business communication.
- CO5 Demonstrate different strategies for using professional communication skills.

**ENG101**  
**Foundation English**

**COURSE CONTENTS**

**UNIT I**

**Communication**

Communication: Nature, Meaning, Definition, Process, Functions and importance, Characteristics of Communication, Verbal and Non-Verbal Communication, Barriers to Communication.

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### UNIT II

#### Listening and Reading Skills

Listening: Process, Types, Difference between Hearing and Listening, Benefits of Effective Listening, Barriers to Effective Listening, Overcoming Listening Barriers, and How to Become an Effective Listener, Developing Reading Skills: Reading Comprehension, Process, Active & Passive reading, Reading speed Strategies, Benefits of effective reading, SQ3R Reading technique.

### UNIT III

#### Basic Grammar

Basic Language Skills: Grammar and usage- Parts of Speech, Tenses, Subject and Verb Agreement, Prepositions, Articles, Types of Sentences, Direct - Indirect, Active - Passive voice, Phrases & Clauses.

### UNIT IV

#### Business Letters

Business Correspondence: Business Letters, Parts & Layouts of Business Letter, Job application and Resume, Application Calling/ Sending Quotations/ Orders/ Complaints. E-mail writing, Email etiquettes

### UNIT V

#### Professional Skills

Negotiation Skills, Telephonic Skills, Interview Skills: Team building Skills and Time management

#### Suggested Readings:

- Adair John (2003). **Effective Communication**. London: Pan Macmillan Ltd.
- Thomson A.J. and Martinet A.V. (1991). **A Practical English Grammar** (4<sup>th</sup> ed). New York: Oxford IBH Pub
- Rizvi Ashraf (2005). **Effective Technical Communication**. New Delhi: Tata Mc Graw Hill
- Kratz Robinson (1995). **Effective Listening Skills**. Toronto: ON: Irwin Professional Publishing.



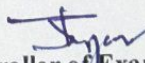
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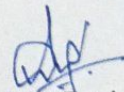
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