SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY 

| Department of Biotechnology | LP: BT22201<br>Rev. No: 01<br>Date: 09/01/2025 |
|---|---|
| B.E/B.Tech/M.E/M.Tech :B.Tech Regulation: 2022<br>PG Specialisation : NA<br>Sub. Code / Sub. Name : BT22201 BioOrganic Chemistry<br>Unit : I | |

**Unit Syllabus: BONDING AND STEREOCHEMISTRY** **9**

Atoms Electrons and orbitals - Covalent Bonds - Octet rule - Polar covalant Bonds – Electronegativity formal charge - Resonance Acids and Bases - Arrhenius and Bronsted Lowry Theories - Acid Base equilbria - SP3 hybridization - Conformations analysis ethane, butane and cyclohexane - Cis- trans isomerism. Denaturation and renaturation of DNA, Hyperchromic effect.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|---|---|---|---|
| 1. | Atoms Electrons and orbitals | TB3-Ch-1- (01-07)<br>TB1-Ch-1-(59-64) | PPT & BB |
| 2. | Covalent Bonds<br>Octet rule<br>Polar covalant Bonds | TB4-Ch-1- (004-005, 007-008)<br>TB3-Ch-1- (008)<br>TB3-Ch-1- (007)<br>TB1-Ch-1- (015-018) | PPT & BB |
| 3. | Electronegativity<br>Formal charge | TB1-Ch-1- (015-018)<br>TB4-Ch-1- (006) | PPT & BB |
| 4. | Resonance Acids and Bases<br><br>Arrhenius and Bronsted Lowry Theories | TB4-Ch-1- (015-019)<br>TB1-Ch-1- (009-013)<br><br>TB4-Ch-1- (031-032) | PPT & BB |
| 5. | Acid Base equilbria **,** SP3 hybridization | TB4-Ch-1- (031-032) | PPT & BB |
| 6. | Conformations analysis ethane, butane and cyclohexane | TB4-Ch-3- (070,090-096)<br>TB1(129-146) | PPT & BB |
| 7. | Cis- trans isomerism | TB4-Ch-3- (087-088) | PPT & BB |
| 8. | Denaturation and renaturation of DNA. | TB5-Ch-4-(96-103) | PPT & BB |
| 9. | Hyperchromic effect | TB5-Ch-4-(86) | PPT & BB |
| **Content beyond syllabus covered (if any):** Definitions of acids and bases- Arrhenius, Brønsted-Lowery and Lewis, Different Types of Energy, Ideal gas law, Geometric isomers, Optical isomers, Structural isomers | | | |

* Session duration: 50 minutes

Sub. Code / Sub. Name: BT22201 BioOrganic Chemistry

Unit : II

**Unit Syllabus: MECHANISMS OF SUBSTITUTION AND ADDITION REACTIONS 9**

SN1 and SN2 reactions on tetrahedral carbon- nucleophiles- mechanism steric effects – nucleophilic addition on Acetals and ketals –– reactions of carbonyl group with amines- acid catalyzed ester hydrolysis – Saponification of an esterhydrolysis of amides. phospodiester bond formation in DNA. Conformational strain- DNA Supercoiling- non-functional proteins of translation.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|---|---|---|---|
| 10. | SN1 and SN2 reactions on tetrahedral carbon | TB4-Ch-11- (365-373) | BLV 1 |
| 11. | Nucleophiles<br><br>Mechanism steric effects | TB4-Ch-4, 11- (129,370)<br><br>TB1-Ch-5, 7, 10- (298-300, 419-420, 586)<br>TB4-Ch-2, 18, 22- (36, 597, 750) | PPT & BB |
| 12. | Nucleophilic addition on acetals | TB3-Ch-9- (489-490) | PPT & BB |
| 13. | Nucleophilic addition on ketals | TB3-Ch-9- (489-490) | PPT & BB |
| 14. | Reactions of carbonyl group with amines | TB4-Ch-19- (637) | PPT & BB |
| 15. | Acid catalyzed ester hydrolysis | TB1-Ch-7- (398-406) | PPT & BB |
| 16. | Saponification of an esterhydrolysis of amides | TB1-Ch-7- (398-406) | PPT & BB |
| 17. | Phospodiester bond formation in DNA | TB5-Ch-3-(60-63) | PPT & BB |
| 18. | Conformational strain- DNA Supercoiling- non-functional proteins of translation. | TB5-Ch-9-(228-233) | PPT & BB |
| **Content beyond syllabus covered (if any):** NIL | | | |

* Session duration: 50 mins

Sub. Code / Sub. Name: BT22201 BioOrganic Chemistry

Unit : III

**Unit Syllabus: KINETICS AND MECHANISM** **9**

Kinetic method – Rate law and mechanism – Transition states- Intermediates – Trapping of intermediates – Microscopic reversibility – Kinetic and thermodynamic reversibility – X–ray diffraction analysis of DNA– the Arrhenius equation Eyring equation - ΔG, ΔS, ΔH, Thermodynamics of coupled reactions.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|---|---|---|---|
| 19. | Kinetic method | TB1-Ch-4- (192-197) | PPT & BB |
| 20. | Rate law and mechanism | TB1-Ch-4- (192-197) | PPT & BB |
| 21. | Transition states | TB1-Ch-4 (200-204) | PPT & BB |
| 22. | Intermediates – Trapping of intermediates | TB1-Ch-4- (197-200) | PPT & BB |
| 23. | Microscopic reversibility | TB1-Ch-4- (200-203) | PPT & BB |
| 24. | Kinetic and thermodynamic reversibility | TB1-Ch-4- (215-217) | PPT & BB |
| 25. | X–ray diffraction analysis of DNA | TB5-Ch-4-(79-81) | PPT & BB |
| 26. | The Arrhenius equation Eyring equation | TB1-Ch-4- (187-192) | PPT & BB |
| 27. | ΔG, ΔS, ΔH, Thermodynamics of coupled reactions | TB1-Ch-4- (187-192) | PPT & BB |

**Content beyond syllabus covered (if any):** Enthalpy, Enthalpy change, Gibbs free energy, Entropy

* Session duration: 50 mins

Sub. Code / Sub. Name: BT22201 BioOrganic Chemistry

Unit : IV

**Unit Syllabus: CATALYSIS** **9**

Reactivity – Coenzymes – Proton transfer – metal ions – Intra molecular reactions – Covalent catalysis – role of catalysis by organized aggregates and phases in synthetic peptide based vaccines, Inclusion Complexation. Immunostimulatory complexes

Objective: To learn about Tumor immunology

| Session No * | Topics to be covered | Ref | Teaching Aids |
|---|---|---|---|
| 28. | Reactivity | TB2-Ch-8- (187-192) | PPT & BB |
| 29. | Coenzymes | RF1-Ch-9- (482-485) | PPT & BB |
| 30. | Proton transfer | RF1-Ch-9- (290-291) | PPT & BB |
| 31. | Metal ions | RF1-Ch-9- (388-390) | BLV 2 |
| 32. | Intra molecular reactions | RF1-Ch-9- (166-167,177) | PPT & BB |
| 33. | Covalent catalysis | RF1-Ch-9- (163-166) | PPT & BB |
| 34. | Role of catalysis by organized aggregates and phases in synthetic peptide based vaccines | TB6(475-488) | PPT & BB |
| 35. | Inclusion Complexation | RF1-Ch-9- (345,443) | PPT & BB |
| 36. | Immunostimulatory complexes | TB6(475-488) | PPT & BB |

**Content beyond syllabus covered (if any):** Nil

* Session duration: 50 mins

Sub. Code / Sub. Name: BT22201 BioOrganic Chemistry

Unit : V

**Unit Syllabus: BIOORGANIC REACTIONS** **9**

Hogsteen base pairing, Bond formation and various bonds in DNA– Terpene biosynthesis Murrlfield state peptide synthesis – Sanger method for peptide and DNA sequencing.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|---|---|---|---|
| 37. | Hogsteen base pairing | RF2-Ch-1-(35-62)<br>RF3-Ch-1-(25-55) | PPT & BB |
| 38. | Bond formation in DNA | TB5-Ch-4-(79-81)<br>TB5-CH-3, 4-(64-67, 87-92) | PPT & BB |
| 39. | Covalent bond in DNA | TB5-Ch-4-(79-81)<br>TB5-CH-3, 4-(64-67, 87-92) | PPT & BB |
| 40. | Hydrogen bond in DNA | TB5-Ch-4-(79-81)<br>TB5-Ch-3, 4-(64-67, 87-92) | PPT & BB |
| 41. | Hydrophobic interactions in DNA | TB5-Ch-4-(79-81)<br>TB5-Ch-3, 4-(64-67, 87-92) | PPT & BB |
| 42. | Terpene biosynthesis | TB3-Ch-10- (608-612) | PPT & BB |
| 43. | Murrlfield state peptide synthesis | TB3-Ch-10- (599-600)<br>TB4-Ch-28- (979-980)<br>RF1-Ch-9- (033) | PPT & BB |
| 44. | Sanger method for peptide sequencing | TB4-Ch-28- (981) | PPT & BB |
| 45. | Sanger method for DNA sequencing | TB4-Ch-28- (982-984) | PPT & BB |

**Content beyond syllabus covered (if any):** Nuclear fission, Nuclear fusion, sequencing, Bioorganic group transfer reactions

* Session duration: 50 mins

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**TEXT BOOKS (TB):**

1. Carey, Francis A. “Organic Chemistry”. 7th Edition, Tata MCGraw Hill, 2009.
2. Page, M.I. and Andrew Williams “Organic and Bio-organic Mechanisms”. Pearson, 2010.
3. A text book of organic chemistry Bansal, Raj k. Wiley eastern chemistry (organic), 1986
4. Organic Chemistry Mehta, Bhupinder; Mehta, Manju Prentice-Hall of India, 2005
5. Friefelder, David, “Molecular Biology” 2nd Edition, Narosa Publications, 1999
6. Kuby J, Immunology, WH Freeman & Co., 7th Edition 2012.

**REFERENCES (RF):**

1. Dugas, Hermann “Bioorganic Chemistry: A Chemical Approach to Enzyme Action” 3rd Edition, Springer, 2003.
2. Karp, Gerald, “Cell & Molecular Biology”: Concepts & Experiments” 4th Edition, John Wiley, 2005.
3. Friefelder, David & George M. Malacinski, “Essentials of Molecular Biology” 2nd Edition, Panima Publishing, 1993.

**BLENDED LEARNING VIDEOS (BLV):**

1. https://youtu.be/c9t4hD2GlcM
2. https://youtu.be/HqurUCH0l6I

| | Prepared by | Approved by |
|---|---|---|
| Signature | | |
| Name | Mr.N.Sathish | Dr.E.Nakkeeran |
| Designation | Assistant Professor | Professor and HOD |
| Date | 09/01/2025 | 09/01/2025 |
| Remarks* : Same lesson plan is followed in the subsequent year | | |
| Remarks*: This lesson plan provides in depth knowledge and idea on Bioorganic chemistry. | | |

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3. Friefelder, David & George M. Malacinski, "Essentials of Molecular Biology" 2nd Edition, Panima Publishing, 1993.

**BLENDED LEARNING VIDEOS (BLV):**

1. https://youtu.be/c9t4hD2GlcM
2. https://youtu.be/HqurUCH0l6I

| | Prepared by | Approved by |
|---|---|---|
| Signature | N. Sathish | 20/1/25 |
| Name | Mr.N.Sathish | Dr.E.Nakkeeran |
| Designation | Assistant Professor | Professor and HOD |
| Date | 09/01/2025 | 09/01/2025 |
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