*Total No. of Questions: 22*

**Enrollment No :** _____

MEDICAPS UNIVERSITY

# Faculty of Science

# End Semester Examination May 2025

## BT3CO04 Chemistry -II

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|---|---|---|---|---|---|
| **Programme** | : | B. Sc. | **Branch/Specialisation** | : | BT |
| **Duration** | : | 3 hours | **Maximum Marks** | : | 60 |

**Note:** *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

*Students must be provided with question papers and the answer books (main and additional, if necessary)*

### Section 1 (Answer all question(s))

| | | Marks | CO | BL |
|---|---|---|---|---|
| **Q1.** | Carbocation is _____ reaction intermediate<br>(●) Positively charged ( ) Negatively charged<br>( ) Neutral ( ) None of these | 1 | 1 | 1 |
| **Q2.** | Carbanion is_____.<br>( ) Neutral (●) Electron rich<br>( ) Electron deficient ( ) None of these | 1 | 1 | 1 |
| **Q3.** | Ethane molecule has _____.<br>( ) Two chiral centers ( ) Three chiral centers<br>( ) Five chiral centers (●) No chiral center | 1 | 2 | 2 |
| **Q4.** | In methane molecule, _____ hydrogen atoms reside on a single plane along with the carbon atom.<br>(●) Two ( ) Three<br>( ) Four ( ) None of these | 1 | 2 | 2 |
| **Q5.** | A leaving group is substituted by an attacking atom or group in _____ reaction.<br>( ) An addition ( ) An elimination<br>(●) A substitution ( ) All of these | 1 | 3 | 2 |
| **Q6.** | For being aromatic, a cyclic, planar molecule must have _____ pi electrons, where *n* is non-negative integer<br>(●) 4n + 2 ( ) 4n<br>( ) 4n + 3 ( ) 4n + 4 | 1 | 3 | 1 |
| **Q7.** | Indole is a _____ organic compound.<br>( ) Monocyclic (●) Bicyclic<br>( ) Tetracyclic ( ) Hexacyclic | 1 | 4 | 1 |
| **Q8.** | The structure of Pyridine possesses Carbon, Hydrogen and _____ atoms.<br>( ) Oxygen ( ) Chlorine<br>(●) Nitrogen ( ) None of these | 1 | 4 | 1 |
| **Q9.** | Enamine reaction involves reaction between secondary amine and _____.<br>( ) Benzene ( ) Napthalene<br>( ) Anthracene (●) Aldehyde or ketone | 1 | 5 | 1 |

**Q10.** The aldol reaction is a _____ bond-forming reaction. **1 5 1**

- (●) Carbon-carbon
- ( ) Carbon-nitrogen
- ( ) Carbon-oxygen
- ( ) Carbon-chlorine

## Section 2 (Answer all question(s))

**Marks CO BL**

**Q11.** Mention two important types of organic reactions where carbocation acts as reaction intermediates. **2 1 1**

| Rubric | Marks |
|---|---|
| $S_N1$ and E1, 1 mark for each of them. | 2 |

**Q12.** Define free radical and briefly discuss its formation. **3 1 2**

| Rubric | Marks |
|---|---|
| • Define free radical - 1 Mark.<br>• Brief discussion about formation - 2 Marks | 3 |

**Q13. (a)** What do you mean by reaction intermediate? Mention different types of carbanions and discuss their stability. **5 1 3**

| Rubric | Marks |
|---|---|
| • Meaning of reactive intermediate - 1 Mark.<br>• Types of carbanion - 2 Marks.<br>• Stability discussion - 2 Marks. | 5 |

**(OR)**

**(b)** Provide a detail discussion about the importance of various reaction intermediates in biological system with examples.

| Rubric | Marks |
|---|---|
| • Detail discussion - 5 Marks | 5 |

## Section 3 (Answer all question(s))

**Marks CO BL**

**Q14.** Explain the relevance of stereochemistry in chemistry with example. **3 2 4**

| Rubric | Marks |
|---|---|
| • Overall explanation with example - 3 Marks | 3 |

**Q15. (a)** Define conformational isomer. Draw the structures of boat and chair conformations of Cyclohexane. Draw various conformations of *n*-butane molecule. **7 2 2**

| Rubric | Marks |
|---|---|
| • Definition of conformational isomer - 1 Mark<br>• Structures of boat and chair conformations - 2 Marks<br>• Conformations of n-butane - 4 Marks | 7 |

**(OR)**

**(b)** What do you mean by optical activity, chiral center and prochiral center? Briefly discuss *E*, *Z*-nomenclature with examples.

| Rubric | Marks |
|---|---|
| • Explanation of optical activity, chiral center and prochiral center - 3 Marks (1 Mark for each).<br>• Brief discussion of *E*, *Z*- nomenclature - 4 Marks | 7 |

## Section 4 (Answer all question(s))

**Marks CO BL**

**Q16.** What is elimination reaction? Provide its classification. How does it differ from addition reaction? **4 3 2**

| Rubric | Marks |
|---|---|
| • Elimination reaction - 1 Mark.<br>• Classification - 2 Marks.<br>• Answer for how does it differ from addition reaction - 1 Mark. | 4 |

**Q17. (a)** Define oxidation and reduction. What is electrophilic aromatic substitution reaction? Explain the mechanism of electrophilic aromatic substitution reaction in detail. **6 3 3**

| Rubric | Marks |
|---|---|
| • oxidation and reduction definition- 1 Mark.<br>• Answer for what is electrophilic aromatic substitution reaction - 1 Mark.<br>• Mechanism of electrophilic aromatic substitution reaction - 4 Marks. | 6 |

**(OR)**

**(b)** Define nucleophile and electrophile. Explain and establish the fact with diagram that $S_N2$ reaction results into inversion of configuration.

| Rubric | Marks |
|---|---|
| • Nucleophile and electrophile definition - 2 Marks.<br>• Explanation and establishment of the fact - 4 Marks. | 6 |

## Section 5 (Answer all question(s))

**Marks CO BL**

**Q18.** What do you mean by heterocyclic compounds? Provide an example and explain how does it differ from Benzene. **2 4 2**

| Rubric | Marks |
|---|---|
| • Heterocyclic compound - 1 Mark.<br>• Answer for example and explanation - 1 Mark (0.5 each). | 2 |

**Q19. (a)** Discuss in detail the synthesis of Purine and its significance in biology. **8 4 3**

| Rubric | Marks |
|---|---|
| • Synthesis - 4 Marks.<br>• Significance - 4 Marks. | 8 |

**(OR)**

**(b)** Write down the structures of Furan, Pyrrole, Imidazole and Thiazole. Discuss synthesis of any one of these and its significance in biology.

| Rubric | Marks |
|---|---|
| • Structures - 4 Marks (1 Mark for each).<br>• Synthesis - 2 Marks.<br>• Significance - 2 Marks. | 8 |

## Section 6 (Answer any 2 question(s))

**Marks CO BL**

**Q20.** What is Schiff base? Briefly discuss the aldol and retroaldol reactions. **5 5 2**

| Rubric | Marks |
|---|---|
| • Schiff base - 1 mark.<br>• Discussion on aldol reaction - 2 marks<br>• Discussion on retroaldol reaction - 2 marks | 5 |

**Q21.** Provide brief description of Umpolung reaction and Michael addition. **5 5 2**

| Rubric | Marks |
|---|---|
| • Brief description of Umplung reaction - 2.5 marks.<br>• Brief description of Michael addition - 2.5 marks | 5 |

**Q22.** What is active methylene group? Provide an example of it. Briefly discuss phase transfer catalysis. **5 5 2**

| Rubric | Marks |
|---|---|
| • Answer for active methylene group - 1 mark.<br>• Answer for the example - 1 mark.<br>• Brief discussion of phase transfer catalysis - 3 marks. | 5 |

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