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**Department of Chemistry**

**College of Science**

**University of Salahaddin-Erbil**

**Subject: Stereochemistry**

**Course Book – (Year 3), 2nd semester**

**Lecturer's name: Dr. Media Noori Abdullah**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | **Stereochemistry** | |
| **2. Lecturer in charge** | **Asst. Prof. Dr. Media Noori Abdullah** | |
| **3. Department/ College** | **Chemistry/ Science** | |
| **4. Contact** | **e-mail: media.abdullah@su.edu.krd** | |
| **5. Time (in hours) per week** | **Theory: 3h**  **Practical: 2 groups, total 6h** | |
| **6. Office hours** | **Wednesday from 8am to 12 am** | |
| **7. Course code** | **None** | |
| **8. Teacher's academic profile** | **https://sites.google.com/a/su.edu.krd/media-abdullah-2019/2020** | |
| **9. Keywords** | **None** | |
| **10. Course overview:**  This course is crucial and recommended for stage three of undergraduate students to understand stereochemistry of the molecules, so the study will be sufficient and comprehensive. At the end of the year, the student will gain full knowledge for future employment. | | |
| **11. Course objective:**  By the end of the course the students should be able to  • Recognise symmetry in organic molecules  • Predict/Rationalise stereo chemical outcomes in organic reactions  Besides, at the end of the year students will have a more advanced level of understanding, of both theoretical and practical of Organic Chemistry. | | |
| **12. Student's obligation**  Students obliged to attend all theoretical lectures and practical sessions for around 14 weeks; quizzes may be given after each lecture.  The practical sessions are to submit a report for each completed experiment, reviewed and corrected report will be returned to the student. | | |
| **13. Forms of teaching**   * Lecture notes prepared in Microsoft PPT, ChemDraw Ultra for drawings and presented to the students using PowerPoint by Data Show. The lecture indicates, introduction, brief review of the last lecture, explain every slide shown, troubleshooting, solve sample questions. Lecture ends with questions/answers and or quiz some times. * The notes usually uploaded for the students on the eLearning website. * After every exam assigned for the students, questions are corrected, marks rewarded, and the following lecture will be discussion to solve the exam questions. Exam answer papers are to be saved for future references. * The exam paper covers most of the lectures given and indicated: Exam instructions, MCQ, definitions, chemical equations, explanations, Draw, give reasons, calculations, comparisons…etc. The questions are usually clear, direct and obvious, starting from easy, medium to hard. * All student marks including attendance and quizzes shall be displayed on the department notes board. All year student effort will be calculated and added to the summer exam along with the practical marks out of a 100%. | | |
| **14. Assessment Scheme**  The course marks out of 100%, breaking down to 50 marks (25 mark for exams including quizzes and classroom activity, and 25 marks for practical) plus 50 marks for final summer theory exam (50 mark sitting exam). | | |
| **15. Student learning outcome:**  The students will learn from the lecturer, and other sources of information including the Educational Websites, books from the library, etc. | | |
| **16. Course Reading List and References‌:**  Books from Library**.**  **1**- Organic Chemistry: Morrison and Boyed  **2**- Organic Chemistry fourth edition. By Francis A. Carey  **3**- Stereo Chemistry of Carbon Compounds (Advanced Chemistry) by Ernest L. Eliel  **4**- Elements of Stereo Chemistry: Ernest L. Eliel (the father of stereo Chemistry)  **5**- Principle and applications of Stereo Chemistry Michael North.  **6**- Introduction to Stereo Chemistry by Kurt Mislow.  **7**- Drug Stereo Chemistry: Analytical Methods and Pharmacology, third Edition, Irving  W. Wainer.  **8**- Topics in stereo chemistry, vol. 23, A JOHN WILEY & SONS, INC., PUBLICATION,  Copyright 2003.  **9**- Organic chemistry by J.S. Fessenden, J.S. Fessenden (4th edition)  **10**- The Chemistry of Heterocycles, Second Edition. By Theophil Eicher and Siegfried Hauptmann, Copyright © 2003 Wiiey-VCH Veriag GmbH & Co. KGaA  **11**- Heterocyclic Chemistry by John A. Joule, Keith Mills  **12**- Handbook of Heterocyclic Chemistry” 2nd Edition, 2000, Pergamon/Elsevier by A. R. Katritzky and A. F. Pozharski  **13**- Handbook of Heterocyclic Chemistry” 3rd Edition by Alan R. Katritzky, Christopher A. Ramsden, john A. Joule  **14-** Heterocyclic- pdf (Synthesis of heterocyclic compounds), Tapio Nevalainen, **15**- Drug synthesis II, 2010, (<http://www.scripps.edu/chem/baran/heterocycles/>)  **16**- Essentials of Heterocíclico Chemistry-III, by Baran, Hafensteiner, Richter (Pdf)  From Google Internet Search ([www.google.com](http://www.google.com/))   And Journals | | |
| **17. The Topics:** | | **Lecturer's name** |
| **Week 1-14, Stereochemistry, Constitutional or structural isomers, Geometric isomers (cis-trans and E and E), Conformational isomers, Fisher projection, Chirality (chiral and achiral molecules), Racemic mixture, Cohn-Ingold- Prelog systems, R and S., Configurations, Resolution of Enantiomers, Molecules with more than one chiral centers, Diasteromers, Meso compounds, stereo features of Drugs, Stereochemistry of Chemical reactions, Mechanism of stereo addition reaction.** | | Dr. Media Noori Abdullah |
| **18. Practical Topics (If there is any)** | |  |
| Stereochemistry experiments including: Each Wednesday and Thursday a 3h practical session will be compulsory for student to practice. Experiments are related to preparation and stereochemistry of Organic compounds.  **Experiment titles:**  1-Praparation of Benzamide and Benzanilide  2-Hydrolysis of Benzamid  3-Nitration of Benzamide and benzanilide  4-Hoffman degradation  5- Benzil rearrangement  6-Preparation of pinacol  7-Pinacol rearrangement  9-Preparation of Schiff base  10-Praparation of quinoxalin  11-Preparation of Aryl Halide  12-Preparation of Anthraquinone  13-Deils Alder reactions  14- Aldol condensation  15-Preparation of Isoborneol  16- Preparation of Diazonium salt and  17-Coupling reaction | | Dr. Media Noori Abdullah 4h  Dr. Peshawa Oso 10h  Jala Bahjet 12h  Naween Mushir 12h  Peshtiwan 10h |
| **19. Examinations: Theory**  **Sample Question paper given to students**  **University of Salahaddin** 3rd stage organic chemistry exam. Time allowed 1.5 hr.  **Science College, Chemistry department**. (Answer all questions on this paper). **Student name**:  Q1. Fill the spaces with suitable words.   1. Stereoisomers are compounds with the same …………………………. but different………………………….in space. 2. Enantiomers are…………………………. that are non-superimposable ………………………………………. 3. Diastereomers are stereo isomers that are ………………………, different…………………………with different……………….. 4. Asymmetric centre…………………………………carbon with………………………groups attached. 5. Optical activity means, the ability to ………………………. the plane of plane……………………light. 6. Chiral compound, a compound that is…………………………….. (Chiral compound will……………………..light). 7. Polari meter ,………………………………that measures the optical rotation of……………………………..compound. 8. Mirror images that can be superposed are…………………………… (Not……………………………….).   **Q2. What is the maximum number of stereoisomers for each of the following groups?**   1. 1, 2-dibromo-1-phenylpropane. 2. 1, 2-dibromo-2-methyl-1-phenylpropane. 3. 2, 3, 4, 5-tetrahydroxypentanol.   **Q3. Assign (R) and (S) Configuration to the Stereoisomers of**   1. 2-butanol 2. 1-bromo-1,2-diphenylpropane (Atomic numbers, Br= 35, C=6, H=1)   **Q4. Star any Chiral Carbon atoms in the following structures.**   |  |  | | --- | --- | |  |  | |  |  | |  |  |   **19. Examinations: Practical Part**  1-Explain Why amide have quite high boiling point.  2-Carboxilic acid derivatives have more reactivity to nucleophilic acyl substitution reactions than aldehydes and ketones.  3-Acid chlorides are more reactive toward nucleophiles acyl substitution than amid  4-Write the mechanism for the preparation of Benzamil.  6-Explain why amid are less reactive to Nucleophilic attack.  7-Write an equation for preparing Nitronium ion.  8-Explain why Benzene does not Undergo addition reaction.  9-Write a mechanism for preparation of benzylic acid.  10-Whate is the Hoffman degradation of Acetamide  11-Explain the low yield of m-nitro benzanilide in Nitration of benzylic acid.  12-Unsubstituted imines are unstable while substituted imines are very stable?  13-Explain why 1, 1-diphenylehtandiol gives diphenyl acetaldehyde not phenyl acetophenone, with mechanism. | | |
| **20. Extra notes:**  None. | | |
| **21. Peer reviewپێداچوونه‌وه‌یهاوه‌ڵ**  This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.  *(A peer is person who has enough knowledge about the subject you are teaching; he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*  ئه‌م کۆرسبووکه‌ده‌بێتله‌لایه‌نهاوه‌ڵێکیئه‌کادیمیه‌وه‌سه‌یربکرێتوناوه‌ڕۆکیبابه‌ته‌کانیکۆرسه‌که‌په‌سه‌ندبکاتوجه‌ندووشه‌یه‌ک بنووسێتله‌سه‌رشیاویناوه‌ڕۆکیکۆرسه‌که و واژووی له‌سه‌ر بکات.  هاوه‌ڵئه‌وکه‌سه‌یه‌که‌زانیاریهه‌بێت له‌سه‌ر کۆرسه‌که‌وده‌بیتپله‌یزانستیله‌مامۆستاکه‌مترنه‌بێت.‌‌ | | |