# CSIR-UGC-NET

## A Detailed Manual Solution of Organic Chemistry

(Name Reaction, Reagents and Reaction Mechanism)

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## A Detailed Manual Solution of Organic Chemistry
(Name Reaction, Reagents and Reaction Mechanism)

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# Preface

This book covers one-pot, cascade, and multistep reactions exclusively in the context of organic chemistry. It has a detailed knowledge of the questionnaires of synthetic organic chemistry and covers the following major topics: one-pot/multi-component/tandem reactions, name reactions, reagents, stereochemistry, anomeric effects, conformational analysis, etc. The title of the book is "CSIR-UGC-NET: A Detailed Solution Manual of Organic Chemistry" and the questionnaires are available from June 2011 to December 2022, including a model paper. The author has made a lot of efforts for the audience to easily understand organic chemistry problems, so they can solve most of the exams without getting more difficulties. I believe that his way of representing and solving the problem will certainly be highly helpful to aspiring synthetic chemists for their higher studies.

The questionnaires have references in some places by considering the national/international books/jounals. It is also worth mentioning that this book also has a few 3D-sketched mechanisms for easy understanding of the complex reactions. This book fully advertises the CSIR-UGC-NET exam and can also be utilized for other exams like GATE, Lectureships, GDC, GIC, PGT, and other national/international competitive subjective/objective exams. The author would like to encourage the readers/audiences, if you are finding any inconsistencies in the mechanisms that are presented in this book. Then provide the answer with a reference that will be modified in the next edition. The answer is that having cited articles/books can be used as a reference against the wrong answer(s) in the near future, but before claiming, you must ensure that the reference(s) is/are right. If any problem is unfortunately written worng then the author will not be responsible for it. This book consists of both basic and advanced levels of organic chemistry problems based on synthetic transformations, name reactions, reagent basis, stereochemistry, etc., which makes it more beneficial for researchers as well. It will definitely give ample knowledge of organic chemistry to those who want to pursue careers in chemistry. As earlier mentioned, the author has tried his best to provide an easy-to-understand mechanism of organic chemistry; thus, he added three-dimensional views of the reactions. The majority of the reaction mechanism is verified by his dearest colleagues. I am appreciative of everyone who has read this book and is also going to read it in the future. If any questionnaires have issues regarding the reaction mechanism or stereochemistry or something is not explained clearly, then please send the email; that will be solved in the next version.

# Acknowledgment

Firstly, I want to express my gratitude to my parents for their financial and moral support during my academic and research career. My sincere gratitude goes out to my research supervisors, Profs. Dr. J. N. Moorthy, Dr. R. Gurunath, Dr. I. N. Namboothiri, Dr. J. H. Kwon and all the other faculties for providing me with an excellent opportunity for the reaserch plateform and kind constant support. My understanding of advanced organic chemistry has significantly increased while attending IITs and thanks to the course work advisors Profs. Dr. N. G. Ramesh, R. Ramapanicker, and V. K. Yadav. I owe a debt of gratitude to Dr. L. D. S. Yadav, Dr. Jagdamba Singh, and Dr. I. R. Siddiqui for helping me via teaching the basic and advanced levels of organic chemistry. My academic background in synthetic organic chemistry and research work have done in synthetic methodologies, asymmetric catalysis and information display techenology. I have completed my UG from the VBSPU Jaunpur and PG degree in organic chemistry at the University of Allahabad, UP. Thus, would liks to thank all the departmental professors of UA and TDPG-VBSPU who help in building up my career in academic as well. During his doctoral program extensively, I worked on hypervalent iodine(V) reagents mediated oxidative transformations and Oxone chemistry at IIT Kanpur. Albiet that I worked in peptides and dendrimer chemistry during my pre-PhD reaserch program at IIT Delhi. Latter, he worked using sulphonyl phthalides reagents to develop new synthetic methodologies for the complex molecules with innovative applications and also gained experience in asymmetric catalysis too. Currently, I have oppointed as a research professor in the display department at KHU, Seoul.

I am appreciative and thankful to Dr. Sudheesh T. Sivanandan for his great comments and suggestions during the final revision of this book. He has completed his integrated MSc at IIRBS, Mahatma Gandhi University, Kerala. Later, he worked some time for a chemical company and then moved to IIT Bombay for the PhD program. Currently, he is working as a PDF scientist at the University of Nottingham, UK. Furthermore, I would like to thank Dr. Rohan R. Erendey, Dr. Dheeraj Kumar, Dr. Abhijeet Kumar, Dr. Amit Rajpoot, and Dr. Suresh Yadav for their comments and suggestions. A special thank you to Dr. K. N. Parida (IISERTVM), Dr. Praveen Kumar (IISERB), Mr. Bharat Singh (IITK) and all the other friends who directly or indirectly supported me in improving the quality of this book. Finally, he would like to express my gratitude to all audiences for their constant support of this book.

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# Some Common Organic Solvents

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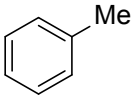
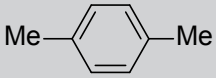
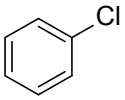
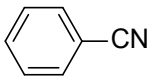
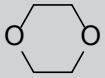
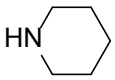
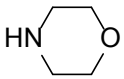
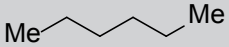
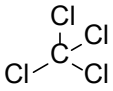
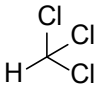
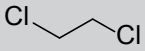
|---|---|---|---|
| Benzene (Ph-H) |  | Toluene (Ph-Me) |  |
| p-Xylene |  | Pyridine |  |
| Chlorobenzene |  | Benzonitrile |  |
| THF |  | Dioxane |  |
| Piperidine |  | Morpholine |  |
| Hexane |  | Cyclohexane |  |
| Carbon tetrachloride |  | Chloroform |  |
| DCM |  | DCE |  |
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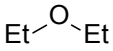
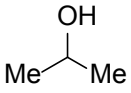
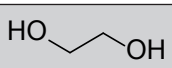
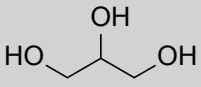
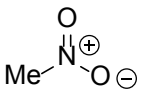
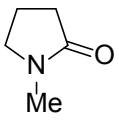
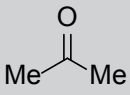
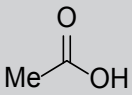
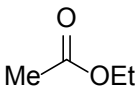
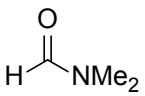
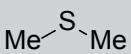
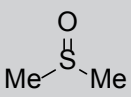
| Ethanol | EtOH | Butanol | BuOH |
| Ethyl ether |  | Isopropyl alcohol (IPA) |  |
| Ethylene glycol |  | Glycerol |  |
| Nitromethane |  | NMP |  |
| Acetone |  | Acetic acid |  |
| Ethyl acetate |  | DMF |  |
| DMS |  | DMSO |  |

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# Spectroscopic Abbreviations

| S. N. | Spectroscopic Terms and Tools | Separation Acronyms |
|---|---|---|
| 1. | δ | Chemical shift (NMR) |
| 2. | CD | Circular Dichroism |
| 3. | CI | Chemical Ionization (mass spec) |
| 4. | CIDNP | Chemically Induced Dynamic Nuclear Polarization |
| 5. | CMR | Carbon-13 Magnetic Resonance |
| 6. | COSY | Correlation Spectroscopy (NMR) |
| 7. | DEPT | Distortionless Enhancement by Polarization Transfer (NMR) |
| 8. | DNMR | Dynamic NMR EI Electron Impact (MS) |
| 9. | ENDOR | Electron Nuclear Double Resonance |
| 10. | ESR (EPR) | Electron (Paramagnetic) Spin Resonance |
| 11. | FT | Fourier Transform |
| 12. | GLC | Gas-liquid Chromatography (VPC) |
| 13. | HETCOR | Heteronuclear correlation (NMR) |
| 14. | HPLC | High Performance Liquid Chromatography |
| 15. | INEPT | Insensitive Nuclei Enhanced by Polarization Transfer (NMR) |
| 16. | IR | Infrared |
| 17. | J | Coupling Constant (NMR) |
| 18. | LC | Liquid Chromatography |
| 19. | LIS | Lanthanide Induced shifts (NMR) |
| 20. | MS | Mass spectrum |
| 21. | NMR | Nuclear Magnetic Resonance |
| 22. | NOE(SY) | Nuclear Overhauser Effect (Spectroscopy) |
| 23. | Rf | Retention Factor (chromatography) |
| 24. | ROESY | Rotating Frame Nuclear Overhauser Spectroscopy (NMR) |
| 25. | TLC | Thin Layer Chromatography |
| 26. | UV | Ultraviolet spectroscopy |
| 27. | VPC | Vapor Phase Chromatography (GLC) |
| 28. | XPS | (ESCA) X-Ray Photoelectron Spectroscopy |

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