



Annexure 'A' of Agenda Mem. No. AC/11/01
(Total Page A-11-01-18) 41-01/A-01
GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

Sector - 16C Dwarka, New Delhi - 110078

F.No. IPU/JR(C)/40th AC/2016/47

Dated: 05.03.2016

Subject- Proceedings of the 40th meeting of Academic Council.

Please find enclosed herewith the proceedings of the 40th meeting of Academic Council of Guru Gobind Singh Indraprastha University held on Tuesday, 1st March 2016 at 11.30 a.m. in the Conference Hall of the University, Administrative Block-'A' wing, Dwarka Campus, New Delhi-110078 for approval.

Observations, if any may kindly be communicated to the office of the undersigned within week, consequent to no observation(s), communicated, the proceedings will be assumed as deemed approved.

Jt. Registrar (Coordination)

coordination112@gmail.com

09868527302/011-25302135

Dated: 05.03.2016

F.No. IPU/JR(C)/40th AC /2016 /47

- 1) All Deans and Directors of Guru Gobind Singh Indraprastha University
- 2) Prof.P.K.Julka, Dept. of Clinical Oncology, AIIMS, New Delhi.
- 3) Prof.M.C.Sharma, School of Education, (IGNOU), New Delhi.
- 4) Prof.M.P.Gupta, Department of Management Studies, IIT, Delhi.
- 5) Prof.A.K.Maitra, Former Director, School of Planning & Architecture, Delhi.
- 6) Prof.Karmeshu, School of Computer & System Sciences, JNU, New Delhi.
- 7) Prof. Surender kumar, Deptt. of Chemical Technology, IIT Roorkee, Uttarakhand.
- 8) Prof.J.P.Khurana, Dept. of Plant Molecular Biology, Faculty of Interdisciplinary & Applied Sciences, University of Delhi, South Campus.
- 9) Prof. Lallan Prasad, Retired Head and Dean of Dept. of Business Economics, Faculty of Applied Social Sciences, University of Delhi, South Campus.
- 10) Shri Arvind Misra, Former Dean, Faculty of Law, Dr. B.R. Ambedkar University, Agra, Ex.Director /Head, Post Graduate Deptt. of Law Agra College, Agra Former OSD (Law) to H.E. the Governor of UP, Lucknow.
- 11) Shri Sandeep Gupta, CEO, Academy of Embedded Technology, Delhi.
- 12) Prof. J.K. Garg, Professor, University School of Environment Management
- 13) Dr.Amar Pal Singh, Professor, University School of Law & Legal Studies.
- 14) Dr. Manpreet Kang, Associate Professor, University School of Humanities & Social Sciences
- 15) Dr. Meenu Kapoor, Associate Professor, University School of Biotechnology
- 16) Dr. Vaishali Singh, Associate Professor, University School of Basic and Applied Sciences

Copy for kind information of the Competent Authority:

- (i) AR to the Vice Chancellor GGSIP University
- (ii) SO to the Pro-Vice Chancellor GGSIP University
- (iii) AR to the Registrar GGSIP University

Jt. Registrar (Coordination)

coordination112@gmail.com

09868527302/011-25302135

24.01/A-82



GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

FORTIETH MEETING

OF THE

ACADEMIC COUNCIL

DATE : 01st March, 2016 (Tuesday)

TIME : 11:30 a.m. onwards

VENUE : CONFERENCE ROOM

PROCEEDINGS

SECTOR -- 16C, DWARKA, NEW DELHI.

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AC40.02	Action Taken Report on the Proceedings of 39 th meeting of the Academic Council, held on 25 th June, 2015.	07
AC40.03	To ratify the decision to include additional information, for all programmes of studies governed by the revised the University Ordinances No. 10 and 11.	07
AC40.04	To ratify the notification of the guidelines to address the operational difficulties arisen due to revision of the University Ordinances No. 10, 11 and repealing of the University Ordinance No.27, for the student batches admitted up to the academic session 2014-2015.	07-08
AC40.05	To ratify the decision regarding the specification of degrees as per the University Grants Commission (UGC), Gazette Notification dated 05 th July, 2014 No.F.5-1/2013 (CPP-II).	08
AC40.06	To inform the Academic Council regarding the statistics of the degrees to be conferred in the Eleventh Convocation of the Guru Gobind Singh Indraprastha University.	08
AC40.07	To consider and approve the list(s) of subject experts to be appointed for various purposes by the Guru Gobind Singh Indraprastha University.	08
AC40.08	To consider and approve the modified eligibility criteria, for creation of posts i.e., "As per Guru Gobind Singh Indraprastha University Recruitment Rules" in place of "As per UGC norms", as had been approved earlier by Academic Council in its 39 th meeting held on 25.06.2015 w.r.t University School of Humanities and Social Sciences.	09
AC40.09	To consider and approve the creation of teaching posts for the present and proposed courses in the University School of Biotechnology (USBT) , to fulfil the manpower needs for teaching, research and entrepreneurship development in biotechnology to be implemented w.e.f. the academic session 2016-2017.	10
AC40.10	To ratify the delinking of the B.Tech. and M.Tech. degrees and to run a single M.Tech. programme (in place of the two at present) as per the revised curriculum, scheme of examinations and admission criteria to be implemented by the University School of Biotechnology (USBT) from the academic session 2016-2017.	10-11
AC40.11	To ratify the implementation of revised scheme and syllabus for M.Tech. (Food Processing Technology) course, offered by the University School of Biotechnology (USBT) , from the academic session 2015-2016.	11

AGENDA No.	AGENDA ITEM(S)	Page No.
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AC40.13	To ratify the implementation of revised scheme and syllabus for Ph.D. course work offered by the University School of Law & Legal Studies (USLLS), from the academic session 2015-2016.	11
AC40.14	To ratify the implementation of revised scheme of evaluation and syllabus for Master of Law (One year), Alternative Dispute Resolution (ADR) course offered by the University School of Law & Legal Studies (USLLS), from the academic session 2015-2016.	12
AC40.15	To ratify the implementation of syllabus, course curriculum, scheme of evaluation, eligibility criteria and admission procedure of M.Phil. (Psychiatric Social Work) course offered by the University School of Medical and Para Medical Health Sciences (USMPHS), from the academic session 2015-2016.	12
AC40.16	To ratify the implementation of revised course curriculum and scheme of examinations for the following programmes offered by University School of Environment Management (USEM), from the academic session 2015-2016:- (i) M.Sc. (Environment Management) (ii) M.Sc. (Biodiversity and Conservation) (iii) M.Sc. (Natural Resource Management) (iv) Ph.D. (Environment Sciences)	12-13
AC40.17	To ratify the implementation of revised scheme and syllabus of Ph.D. course work of University School of Education (USE), from the academic session 2015-2016.	13
AC40.18	To ratify the implementation of revised scheme and syllabus for Ph.D. courses in the discipline of (i) Physics (ii) Chemistry and (iii) Mathematics offered by the University School of Basic & Applied Sciences (USBAS) from the academic session 2015-2016.	13
AC40.19	To consider and approve the academic disciplines and syllabus for Research Aptitude Test, for the Ph.D. programmes offered by the University School of Engineering & Technology (USET), to be implemented from the academic session 2016-2017.	14
AC40.20	To ratify the implementation of the minor modification(s) in the scheme and syllabus of the Bachelor of Technology (B.Tech.) programmes approved by the Board of Studies of the University School of Engineering & Technology (USET):- (i) Electronics & Communication Engineering (ii) Mechatronics (iii) Computer Science & Engineering (iv) Electrical Engineering (v) Electrical & Electronics Engineering	15

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41.01/A-05

AGENDA No.	AGENDA ITEM(S)	Page No.
AC40.21	<p>To consider and approve the implementation of the minor modification(s) in the existing scheme and syllabus of Master of Technology (M.Tech.) in the following programmes approved by the Board of Studies of the University School of Information and Communication Technology (USICT), from the academic session 2015-2016:-</p> <p><u>M.Tech.(Regular Programme):-</u>(i)Information Technology, (ii) Computer Science & Engineering,(iii) Information Security , (iv)Electronics & Communication Engineering, (v)Digital Communication, (vi)Signal Processing, (vii) RF & Microwave Engineering and (viii)VLSI Design</p> <p><u>M.Tech.(Weekend Programme):-</u> (i) Computer Science & Engineering (ii) Information Technology (iii) Electronics & Communication Engineering</p>	15-16
AC40.22	To ratify the Admission Brochure of the University for the Academic Session 2016-2017.	16
AC40.23	To consider and approve the institution of an Award (Gold Medal) in the name of Late Dr. Bhaskar Prakash Joshi (Ex-Registrar, Guru Gobind Singh Indraprastha University).	16
	Table Agenda	
AC40.24	To ratify the extension of last date of submitting eligibility proof by November 2, 2015 for result awaited students of Engineering, B. Arch. & Professional Programmes (Except MBBS / BDS / PGMC / SSMC), admitted during Academic Session 2015-2016.	17

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The course curriculum and scheme of examinations for the above programmes have been revised as per the UGC guidelines, merging some old papers and including important aspects like wetland. The revised scheme and syllabus has been implemented with the approval of Competent Authority from Academic Session 2015-2016. The Academic Council after consideration ratified the revised course curriculum and scheme of examinations for the above programmes offered by University School of Environment Management as implemented from academic session 2015-2016.

Annexed as Annexure 'N' of Agenda Item No. AC40.16 (Page N-01 to N-4)

Agenda Item No. AC40.17: To ratify the implementation of revised scheme and syllabus of Ph.D. course work of University School of Education (USE), from the academic session 2015-2016.

In pursuance of the provision of regulations of the University Ordinance 12 for programmes leading to the degree of Doctor of Philosophy (Ph.D.), the University School of Education on the recommendation of sub-committee of the Academic Council (15th December 2015) has updated and revised scheme and syllabus for Ph.D. coursework. The revised scheme and syllabus has been implemented with the approval of Competent Authority from Academic Session 2015-2016. The Academic Council after consideration ratified the revised scheme and syllabus for Ph.D. coursework implemented from Academic Session 2015-2016.

Annexed as Annexure 'O' of Agenda Item No. AC40.17 (Page N-01 to N-10)

Agenda Item No. AC40.18: To ratify the implementation of revised course curriculum and scheme of examinations for Ph.D. courses in the discipline of (i) Physics (ii) Chemistry (iii) Mathematics offered by the University School of Basic & Applied Sciences (USBAS) from the academic session 2015-2016.

In pursuance of the provision of Regulations of the University Ordinance 12 for programmes leading to the degree of Doctor of Philosophy (Ph.D.), the University School of Basic & Applied Sciences has revised the course curriculum and scheme of examinations for Ph.D. courses as approved by the sub-committee of Academic Council (17th September, 2015) in the following disciplines:

- (i) Physics
- (ii) Chemistry
- (iii) Mathematics

The revised curriculum and scheme of examinations for Ph.D. programme has been implemented with the approval of Competent Authority from academic session 2015-2016.

The Academic Council after consideration ratified revised course curriculum and scheme of examinations for the above programmes as implemented from Academic Session 2015-2016.

Annexed as Annexure 'P' of Agenda Item No. AC40.18 (Page - P-01 to P-33).

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University School of Basic & Applied Sciences Guru Gobind Singh Indraprastha University



Scheme and Syllabus for PhD Programmes In Chemistry

Scheme and Syllabi 2015 – onwards

Entrepreneurship | Employability | Skill Development

Approved in the 40th meeting of the Academic Council held on 01-03-2016 vide agenda item 40.18 w.e.f. 2015

SCHEME AND SYLLABUS
for
DOCTOR IN PHILOSOPHY
In Chemistry

Scheme of Ph. D. in Chemistry

S. No.	Code	Paper	L	P	Credits
1.	PES 101	Research Methodology for Science & Technology	4	0	4
Elective (Choose atleast One)					
2.	CWC 102	Biological Chemistry	4	0	4
	CWC 103	Advanced Spectroscopic Techniques	4	0	4
3.	CWC 104	Analytical Chemistry	4	0	4
4.	CWC 105	Chemical Synthesis of Nanomaterials	4	0	4
5.	CWC 106	Organometallic Chemistry	4	0	4
6.	CWC 107	Chemistry & Synthon Approach	4	0	4
7.	CWC 108	Synthesis, Isolation and Purification of air Sensitive Compounds	4	0	4
8.	CWC 109	Synthesis and Application of Organophosphorus Compounds	4	0	4

Paper Name: Research Methodology for Science & Technology Credit: 3

Lectures: 40

Paper Code: PES – 101

Unit – I

Definition, motivation & significance of research, types of research, research process and steps in conducting research; Planning research Problem identification and formulation; Research design; Application of Research scenario in India.

Unit – II

Review of the publisher research in the relevant field; Re-viewing literature; Report Preparation, Structure of Report, Report Writing Skills, Citations, Research Papers,; formulation of research projects proposal; Types of reports, bibliography.

Unit – III

Values, standards & practices; scientific misconduct; human participants & animal subjects, authorship allocation of credit, competing interests, commitments & values. Definition, types of plagiarism, unintentional plagiarism, mechanisms for avoiding plagiarism.

Unit – IV

Understanding of invention & innovation and its role in economic development; patents & copyrights, importance & basic knowledge of Intellectual Property Right (IPR); what can and cannot be protected.

SUGGESTED REFERENCES

1. Research Methodology Methods and Techniques - C.R. Kothari, New Age Intl. Pub. (2004)
2. Business Statistics for contemporary decision making- Ken Black, John Wiley and Sons, Inc. 2010.
3. Research Methodology (Concept and Cases)-Deepak Chawla & Neena Sodhi, Vikas Publication House (P) Ltd. (2011)
4. Research Methodology- Debashis Chokarvaty, Surbhi (P) Ltd. (2010)
5. Research Methodology-Navin Sharma, Deep & Deep (P) Ltd. (2007)
6. Research Methodology -Ranjit Kumar, Delhi Pearson Education (2006)
7. “The Role of Invention, Innovation and The Industrial Property System in Economic Development”,
www.wipo.int/cdocs/mdocs/innovation/en/.../wipo_inn_cai_97_1.doc

8. MLA Handbook for Writers of Research Papes- Joseph Gibaldi, New Delhi, Affiliated East West Press (1999 15th edition).

Paper Name: Biological Chemistry

Credit: 3

Lectures: 40

Paper Code: CWC - 102

Unit – I

[10]

Introduction to Biomolecules: Amino Acids, Protein, Carbohydrates, Lipids and their metabolism, Protein modification: Enzymatic and non enzymatic.

Unit – II

[10]

Chromatography: Gas Chromatography and High Performance Liquid Chromatography-instrumentation, detectors and applications, Gel filtration, Ion Exchange chromatography, Affinity chromatography and Electrophoresis.

Unit – III

[10]

Enzymes: An Overview of Kinetics and Regulation, Biocatalysis Metabolic Pathways and their Regulatory Mechanisms.

Unit – IV

[10]

Synthesis of targetoriented drugs and their biological activity evaluation: synthesis of different target oriented molecules and their biological activities like antioxidant, antifungal, anticarcinogen, antimicrobial, etc. evaluation.

Text / Reference Book:

1. Lahninger Principles of Biochemistry by Albert L. Lehninger, David L. Nelson, Michael M. Cox. 4th Edition, 2004. Publisher: W H Freeman & Co.
2. Quantitative Chemical Analysis by Daniel C. Harris. 7th Edition, 2006. Publisher: W. H. Freeman and Company.
3. Biochemistry by LubertStryer, 4th Edition, 1995. Publisher: W H Freeman & Co.

Paper Name: Advanced Spectroscopic Techniques

Credit: 3

Lectures: 40

Paper Code: CWM - 103

Objective: This course intends to develop the skill to apply common Spectroscopic Techniques to analysis Chemical compounds among students.

Unit – I: UV-V is Spectroscopy

8 h

UV-Vis Spectra-Chromophores and auxochromes, intensity of absorption bands – factors affecting the intensity of absorption, spectra of dienes, unsaturated carbonyl compounds, Spectra of Transition metals, Selection Rules.

Unit – II: Infrared Spectroscopy

15 h

Theory, Instrumentation, Sample Handling, Interpretation of Spectra, vibrational frequency of characteristic groups and factors affecting them, finger print region and its significance. Identification of functional groups and inter and intra molecular hydrogen bonding. Importance of far infrared region.

Unit – III: NMR Spectroscopy

12 h

Basic theory and applications of nuclear magnetic resonance spectroscopy. Instrumentation and sample handling; Chemical shift; Spin-spin coupling: Chemical shift equivalence; Magnetic equivalence; Geminal and vicinal coupling: Nuclear Over Hauser Effect; ^{13}C NMR spectroscopy; ^{13}C NMR Chemical shifts, interpretation of spectra.

Unit – IV: EPR Spectroscopy

10 h

Introduction & Principle of EPR spectroscopy, Instrumentation, spectral analysis & structural elucidation, Factors affecting EPR spectra, Origin of EPR signal, MB-distribution, Spectral parameters, g-factor, Hyperfine coupling, Resonance Line width definition, Pulsed EPR and applications.

Recommended Books:

1. I. J. Bellamy, The Infra-red Spectra of Complex Molecules, Chapman and Hall, London (1975), (3rd Edition ed.)
2. J. R. Dyer, Organic spectroscopy, 1965
3. R. M. Silverstein, F. X. Webster, John Willey & Sons, 6th Edition, 1997
4. R. S. Drago, Physical Methods in Inorganic Chemistry, 1992.

Paper Name: Analytical Chemistry
Paper Code: CWC - 104

Credit: 3 Lectures: 40

Objective: This course intends the student to develop the skill of using various analytical methods to characterize the chemical compounds.

Unit – I: Separation Methods

15 h

Chemical Separation in Analytical Chemistry: Principles, Techniques and applications of the liquid chromatography: High-Performance Liquid Chromatography (HPLC); Thin Layer and column Chromatography; Gas chromatography: Gas chromatographic columns and stationary phases.

Unit – II: Thermal Methods

10 h

Basic principles and applications of Thermo gravimetric method; Differential thermal analysis; Differential Scanning Calorimetry; Dynamic mechanical analysis.

Unit – III: Surface Characterization by Spectroscopy and Microscopy

08 h

Lattice, Lattice symmetry; Characterization of powder and thin films; Line Probe analysis, X-ray diffraction.

Unit – IV

12 h

Near Field – AFM, STM; far field: SEM, TEM and related error analysis.

Recommended Bibliography:

1. Analytical chemistry by Gary D. Christian, Wiley India
2. Kennedy J. H., Analytical Chemistry: Principles, 2d ed., 1990
3. Hargis L.G., Analytical chemistry: Principles and techniques, 1988
4. Kolthoff I. M. and Elving P. J., Treatise on analytical chemistry, Volume 77, Issue 20, 1965, Pages 927.

Paper Name: Chemical Synthesis of NanoMaterials
Paper Code: CWC – 105

Credit: 3 Lectures: 40

Unit – I

Chemical precipitation and co-precipitation: Theory & Thermodynamics, nucleation, growth, Oswald Ripening and Stabilization. Microwave assisted co-precipitation; Sonochemical assisted co-precipitation. Metal nanocrystals Precipitation of Metals by Radiation-assisted reduction; Precipitation of Metals by Thermolysis routes.

(15)

Unit – II

Sol-gel synthesis: Fundamental steps, Chemistry of Metal Alkoxides, Chemistry of aqueous metal cations, Xerogels & Aerogels, Gel singtering. Microemulsions or reverse micelles: Fundamentals, Surfactants & their selection, Phase equilibria, Reaction Dynamics. Synthesis in supercritical fluids & Solvothermal synthesis.

(15)

Unit – III

Core-Shell structured nanocomposites; Superhard Nanocomposite; Nanoparticles polymer ensembles; Assembly of polymer-Nanoparticles composite material.

(10)

Books recommended:

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et. Al.
2. Nanochemistry: A Chemical Approach to Nanomaterials – Royal Society of Chemistry, Cambridge, UK 2005
3. Nanocomposite science and technology – P. M. Ajayath, L. S. Schadler, P. V. Braun, Wiley, New York.
4. Active Metals: Preparation, characterization, applications – A. Furstner, Ed., VCH, New York 1996
5. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.

Paper Name: Organometallic Chemistry
Paper Code: CWC - 106

Credit: 3 Lectures: 40

Objective: This course is intended to provide students with an introduction to the field of organometallic Chemistry covering concepts in bonding, synthesis and catalysis. Students will become familiar with common ligands and preparative methods in organometallic chemistry, theories of bonding and electronic structure, basic reaction mechanisms and applications to catalysis in organometallic chemistry

Unit – I: Fundamental Aspects

15 h

Synthesis, Bonding, structure and reactivity of organometallics and their application in Homogeneous catalysis. Physical characterization of organometallic compounds by IR. Raman. NMR, EPR, Mossbauer and UV.

Unit – II: Metal-Ligand Bonding and Reactions

10 h

Ligand classes, electron counting and 18 electron rule, sigma and pi bonding ligands, Metal-ligand multiple bonding in carbenes, carbynes, imidos, oxos and nitrides. Metallocenes and metal clusters, Qualitative MO configurations.

Unit – III: Organometallic Reactions

5 h

Reactions of Coordinated ligands, migratory insertions, beta-H elimination, oxidative addition reductive C-H activation and agnostic interactions.

Unit – IV: Homogeneous and Heterogeneous Catalysis

10 h

Oxidative, addition, Reductive, Eliminations, Alkene isomerisation, Alkene hydrogenation, hydrogenation, hydroformylation, hydroamination, C-C cross coupling, C-N and C-X cross coupling, reagents, Organolithium and Organomagnesium.

Recommended Bibliography:

1. J. H. Harwood, Industrial Applications of the Organometallic Compounds. A. Structure Survey, Chapman and Hall, London, 1963.
2. The organometallic Chemistry of the Transition Metals, 5th Ed. By Robert H. Crabtree, Wiley 2009
3. P. M. Treichel and F. G. A. Stone, in Advances in Organometallic Chemistry, Vol. I, Academic Press, New York, 1964.

4. Organometallic Chemistry – An Introduction by R. C. Mehrotra and A. Singh, New Age International , New Delhi 2007
5. An Introduction to Inorganic Chemistry by K. F. Purcell and J. C. Kotz, Sounders College 1980
6. Organometallic Reagents in Synthesis by P R. Jenkins Oxford 1992

Paper Name: Heterocyclic Chemistry & Synthon Approach Credit: 3 Lectures: 40
Paper Code: CWC - 107

Unit – I

Chemistry of Heterocyclic Compounds: Synthesis and reactivity of Benzofuran, Benzothiophene, Benzopyrroles, Indole, Pyrimidine, Pyrazine, Oxazole, Quinoline and Isoquinoline.

10

Unit – II

Industrial Oxidizing and Reducing Agents: Reactions and mechanism of industrial Oxidizing agents: KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$ and H_2O_2 .

Reducing Agents: Na_2SO_3 and $\text{Na}_2\text{S}_2\text{O}_3$

Industrial Metals: Catalytic Reactions (hydrogenation, Zeigler Natta process, Wacker process and Fischer Tropsch process) of Raney nickel, Pd, Cr, V, Pt and Ti.

10

Unit – III

Synthon Approach: Definition of terms – disconnection, synthon, functional group interconversion (FGI), Basic rules in Disconnection, Use of synthon approach in synthesis of following compounds: Terfenadine, Ibuprofen, Propanolol, Fentanyl, Ciprofloxacin, Diclofenac.

10

Unit – IV

Organometallic compounds:

Preparation, general reactivity and biological applications of the following in organic synthesis: Group I & Group II metal (Li, Mg, Cd and Zn) organic compounds.

Transition Metals: Cu, Pd, Ni and Cr. Organic compounds.

10

References:

1. Organometallics in organic synthesis – J. M. Swan and D. C. Black (Chapman and Hall).
2. Designing of organic synthesis – S. Warren (Wiley)
3. Advanced organic chemistry by Jerry March, Wiley Eastern 4th Edition.
4. Advanced organic chemistry, Part B-F, A Carey and R. J. Sundberg 5th edition 2007
5. Organic Chemistry – I. L. Finar, volume II, 5th edition.

Paper Name: Synthesis, Isolation and Purification of Air Sensitive Compounds

Credit: 3 Lectures: 40

Paper Code: CWC - 108

Unit – I

10 h

Solvent Purification: Distillation of organic solvents and distillation under vacuum and use of nomograph (manometer / vacuum pump and Schlenk Apparatus) to establish b. p. of a solvent/ compound at various pressures, common drying agents, design of apparatus for distillation under inert atmosphere of dry nitrogen or argon gas.

Unit – II

10 h

Schlenk Techniques: Synthesis of air sensitive compounds and manipulation of air sensitive reactions. Designs of Schlenk Apparatus- round bottom Schlenk flask, Schlenk tubes, Young tubes.

Unit – III

10 h

Purification of Air Sensitive Compounds: Recrystallization at room temperature / low temperature under inert atmosphere, washing/ removal of impurities from unstable compounds at low temperature.

Unit – IV

10 h

Chromatography Techniques: column chromatography and low temperature column chromatography, design of column for low temperature chromatography

Suggested Reading and Reference:

1. A laboratory handbook of chromatography Synthesis, E. Heftmann, 1975, New York.
2. Organic Experiments, K. L. Williamson, 2007, New York
3. Organometallic Reagents in Synthesis, R. Jenkins, 1992, Oxford

Paper Name: Synthesis and Application of Organophosphorus Compounds

Credit: 3 Lectures: 40

Paper Code: CWC - 109

Unit – I

Organometallic Reagents in Synthesis: Metallated saturated hydrocarbons, metallated alkenes, metallated alkynes, metaalated aromatic compounds, metallated heterocyclic compounds and heteroatom stablised organometallic reagents.

(10 hrs.)

Unit – II

Chemistry of Phosphorus (I) Compounds: Phosphinidenes, synthesis and stabilization of phosphinidenes, singlet and triplet phosphinidenes, insertion reactions of phosphinidenes, reagents to generate phosphinidenes.

(10 hrs.)

Unit – III

Chemistry of Phosphorus (III) Compounds: Synthesis and stabilization Phosphines/ Phosphanes, Phosphaalkenes, Phosphaalkynes, Phosphapines Phosphazenes, Phosphites, Arbuzov reactions.

(10 hrs.)

Unit – IV

Chemistry of Phosphorus (V) Compounds: Phosphine chalcogenides- synthesis and their application, Phosphorus ylides, Wittig reactions. Arbuzov reactions, phosphonates.

(10 hrs.)

Suggested Readings and References:

1. Organometallic Reagents in Synthesis, Paul R. Jenkins, **1992**, Oxford
2. Phosphorus Ylides, Oleg I. Kolodiazhnyi, 1999, Wiley-VCH, Weinheim
3. Multiple Bonds and Low Coordination in Phosphorus Chemistry, F. Mathey, Edited by M. Regitz and O. J. Scherer, 1990, Georg ThieneVerlag, New York
4. Phosphorus: the Carbon Copy, K. B. Dillon, F. Mathey, and J. F. Nixon, 1998, Wiley, Chichester