JAMIA MILLIA ISLAMIA
(A Central University by an Act of Parliament)
जामिया मिल्लिया इस्लामिया

Department of Chemistry
Faculty of Natural Sciences
रसायन शास्त्र विभाग
प्राकृतिक विज्ञान संकाय
شعبۂ کیمیا
فیکلٹی برائے قدرتی علوم

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MINUTES OF A MEETING OF THE BOARD OF STUDIES OF DEPARTMENT OF CHEMISTRY HELD ON 31st October, 2014.

A meeting of the Board of Studies of Department of Chemistry was held on **31st October, 2014 at 3:30 p.m.** in the office of Head, Department of Chemistry. The following members attended the meeting:

1. Prof. Tabrez A. Khan (Chairperson)
2. Prof. Anwar Ali
3. Prof. Sharif Ahmed
4. Prof. Khalid Iftikhar
5. Prof. Amir Azam
6. Prof. Zaheer Khan
7. Prof. Rabia Ahmad
8. Prof. Nahid Nishat
9. Prof. Imran Ali
10. Dr. Nasreen Majumdar
11. Dr. Athar A. Hashmi
12. Dr. Faqeer Mohammad
13. Dr. Saiqa Ikram
14. Dr. Nasimul Hoda
15. Dr. Tokeer Ahmad
16. Mr. Sapan Kumar Jain
17. Dr. Rahisuddin
18. Dr. Ufana Riaz

Agenda Item No. 1:

The minutes of the meeting of the Board of Studies of the Department held on 15th May, 2014 were confirmed.

Agenda Item No. 2:

Examiners and moderators for B.Sc and M.Sc. semesters theory examinations 2014 were appointed. Prof. Amir Azam was appointed as the Coordinator for B.Sc. semester examinations 2014-2015.

Agenda Item No. 3:

The schedule for theory and practical examinations of M.Sc. and practical examinations of B.Sc. classes were approved.

Agenda Item No. 4:

The following committees were constituted to complete the documentation related to NAAC:

A. Updating of Publications:

Mr. Sapan Kumar Jain
Dr. Rahisuddin
Dr. Ufana Riaz

B. Curriculum Design and Development:

Prof. Sharif Ahmed
Dr. Athar A. Hashmi

C. Preparation of Presentation:

Prof. Khalid Iftikhar
Dr. Tokeer Ahmad

D. Teaching and Learning:

Prof. Anwar Ali
Prof. Imran Ali
Dr. Saif Ali Chaudhary

E. Research/Consultancy/Patent:

Dr. Saiqa Ikram
Dr. Nasimul Hoda

F. Time Table/Co-curricular activities:

Prof. Nahid Nishat
Dr. Athar A. Hashmi

Supplementary Agenda:

1. The synopses of the research after completion of pre-Ph.D. Course Work, 2013-2014 by the candidates were considered and approved (ANNEXURE-I).

2. The syllabi of pre-Ph.D. Course Work Paper-II of Ph.D. students admitted in 2014 were considered and approved (ANNEXURE-II).

3. Corrections in the Ph.D. Thesis Titles:

On the request of research scholars and recommendations by the supervisor concerned, the following corrections in Ph.D. thesis titles were approved:

Name of Scholar	Supervisor	Old Title	Corrected Title
Afreen Inam	Prof. Amir Azam	Synthesis, Characterization and Biological evaluation of some heterocyclic based compounds	Synthesis, Characterization and Biological Evaluation of Some Heterocyclic Based Compounds
Mohammad Fawad Ansari	Prof. Amir Azam	Synthesis and biological activity of some heterocyclic compounds	Synthesis, and Biological Activity of Some Heterocyclic Compounds
Sahar Uzair	Prof. Anwar Ali	Study of dye-surfactant and dye-amino acid Interactions in aqueous medium	Study of Dye-Surfactant and Dye-Amino Acid Interactions in Aqueous Medium

4. Appointment of Co-supervisor:

The Board appointed Prof. Tabrez Alam Khan as Co-supervisor of Mr. Ommer Bashir on the request of Supervisor Prof. Zaheer Khan.

5. **Revision of Syllabi**:

(i) The revised syllabi of M.Sc. IIIrd semester (Organometallic Chemistry), Paper No. XIII(i) and M.Sc. IIIth semester (Heterocyclic Chemistry in place of Chemistry of Natural Products-I), Paper No. XIII(iii) were approved effective from 2014-15.

(ii) The revised syllabus of B.Sc. (Hons.) Semester – I (Physical Chemistry, Paper No. I) was considered and approved effective from 2014-15.

(iii) The following committee was constituted to review/revise the syllabi of B.Sc. semester courses:

Prof. Zaheer Khan
Dr. Nasimul Hoda
Dr. Rahisuddin

The meeting concluded at 5:00 pm.

Tabrez Alam Khan
Head
HEAD
DEPARTMENT OF CHEMISTRY
JAMIA MILLIA ISLAMIA
(CENTRAL UNIVERSITY)
NEW DELHI-110025

SYLLABUS-

M.Sc. (Semester – III)

Organometallic Chemistry

Unit – I: Organometallics: Main Group and Transition Elements

- Introduction and classification of organometallic complexes
- IUPAC nomenclature for metal-π-complexes
- Ziese salt, bonding and structure- stability of metal-alkene complexes
- Synthesis of organometallic complexes- direct synthesis, redistribution method, metal exchange, ligand exchange, addition reaction, cyclization, sigma-pi -rearrangements and substitution methods
- Importance of organometallic complexes as reagents, additives and catalysts

Unit – II: Metal Carbonyls

- Structure, π-bonding, bonding modes of CO
- Syntheses of metal carbonyls
- Reactions of metal carbonyls
- Carbonyl anions, cations and hydrides
- Colman's reagents
- Metal Nitrosyls

Unit – III: Ligands; Alkenes, Alkynes, Alkyl and Aryl Groups with Higher Hapticity

- Models of alkene and alkyne – metal bonding
- The concept of Umpolung
- Pauson-Khand reaction
- Cyclopentadienyl as ligand, Metal sandwich compounds, Ferrocene and its reactions

- Schwartz's reagent and hydrozirconation
- Arene π-complexes and their reactions
- COT as ligand
- Neutral spectator ligands

Unit –IV: Structure Elucidation and IR Spectroscopy of Organometallic Complexes

- Vibrational spectra and its applications
- Study of complex compounds- factors controlling the character of vibrations of large molecules
- Coordination of inorganic groups in metal π–complexes,
- Coordination of sulphate ions
- Coordination of nitrate ions
- Cyanate and thiocyanate complexes; study of bridged ligands
- Coordination and Changes in the vibrations of C--O bonds
- Coordination of alkenes and changes in vibration in C=c bonds

Books suggested

- Metallo-organic Chemistry- Anthony J Pearson, John Wiley & Sons Inc, (1985)
- Inorganic Chemistry – Principles of Structure & Reactivity, J E Huheey, Elllen A Keiter & Richard L Keiter, IV Edition (2005)
- Introduction to metal pi-complex chemistry- M. Tsutsui, M.N. Levy, A. Nakamura, M. Ichikawa and K. Mori, Plenum Press, New York Heme (1970).
- Organometallic Chemistry - R. C. Mehrotra & A. Singh, Wiley Eastern Ltd. (2000) .
- Advanced Inorganic Chemistry - F Albert Cotton, Geoffrey Wilkinson, Carlos A Murillo & Manfred Bochmann, VI Edition, John Wiley & Sons Inc (1999)

M. Sc. CHEMISTRY III[rd] SEMESTER
ORGANIC CHEMISTRY
Heterocyclic Chemistry
PAPER XII(iii)

Unit 1. Nomenclature of Heterocycles

Replacement and systematic nomenclature (Hantzsch-Widman system) of monocyclic, fused and bridged Heterocycles.

Unit 2. Three membered Heterocycles

General Considerations: Structure, synthesis and reactivity of the following ring systems:

Three-membered rings: Aziridines, Oxiranes,thiiranes

Unit 3. Four membered Heterocycles

General Considerations: Structure, synthesis and reactivity of the following ring systems:

Four-membered rings: Azetidines, Oxetanes, thietanes

Unit 4. Five membered Heterocycles

General Considerations: Structure, synthesis and reactivity of the following ring systems:

a. Pyrroles, Furan

b. Five-membered rings containing two heteroatoms: Imidazoles, Oxzoles, Thiazoles, Pyrazoles, Isoxazoles, Isothiazoles.

Books Recommended

1. T.L. Gilchrist, *Heterocyclic Chemistry*, 3rd Edition (1997) Addison-Wesley Longman Ltd., England

2. R.K. Bansal, *Heterocyclic Chemistry: Syntheses, Reactions and Mechanisms*, 3rd Edition (1999), New Age International, Publisher, New Delhi.

3. A.R. Katritzky, C.A. Ramsden, J.A. Joule and V.V. Zhdankin, *Handbook of Heterocyclic Chemistry*, 3nd Edition (2010), Elsevier, Oxford, UK.

4. Heterocyclic Chemistry, 4th ed. J.A. joule and K. Mills Blackwell Publishing, Indian Reprint 2004.

5. *Heterocyclic Chemistry Vol-I-III,* 1st ed. R.R. Gupta, M. Kumar, V. Gupta Springer-Verlag, Berlin Heidelberg Publication(2005)

6. *Aromatic Heterocyclic Chemistry: David T. Davies, 1992, Oxford University*

M. Sc. CHEMISTRY IVth SEMESTER
ORGANIC CHEMISTRY
Chemistry of Natural Products

PAPER XVI(iii)

Unit I: Alkaloids:
Introduction, Occurrence, Nomenclature, Classification based on nitrogen heterocyclic ring. Isolation, General methods of structure elucidation, Degradation, Physiological actions, Role of alkaloids in plants and their physiological action.

Synthesis of the following alkaloids:
Coniine. Ephedrine, Morphine and Quinine.

Unit II: Terpenoids:
Introduction, Occurrence, Classification, Nomenclature, Isolation, Isoprene rule, General methods of Structural Determination.
Synthesis of the following molecules:
Geraniol, α-Pinene, Camphor, Menthol, Phytol and Zingiberene.

Unit III: Flavonoids:
Introduction, Occurrence, Nomenclature, Isolation, General Methods of Structural Determination, Synthesis of Apigenin, Luteolin, Quercetin, Myrcetin, Diadzein, Vitexin, .Cyanidine and Hirsutidine.

Unit IV: Steroids:
Introduction, Occurrence, Nomenclature, Isolation, Basic skeleton, Diel's hydrocarbon and Stereochemistry, General Methods of Structural Determination.
Synthesis of the following steroids:
Aldosterone, Androsterone, Cholesterol, Estrone, Progesterone and Testosterone.

Books Recommended:

1. I.L. Finar, Organic chemistry, Vol. II, ELBS Publications, UK.
2. J. Mann, R.S. Devison, J.B. Hobbs, D.V. Banthrope and J.B. Harborne, Natural products chemistry and biological significance, Longman Publisher, Essex, UK.
3. B.A. Bohm, Introduction to flavonoids, Harwood Acad. Publishers, USA.

Revised Syllabus

B.Sc. (Hons.) Chemistry: Semester-I
Physical Chemistry
Paper No. - I

Unit I. Gaseous States

Gas Laws, Ideal Gas Equation, Dalton's Law of Partial Pressure, Graham's Law of Diffusion, Postulates of Kinetic Theory of Gases, Kinetic Gas Equation. Deviation from Ideal Behavior: Effect of Temperature and Pressure.

Molecular Velocities: Root Mean Square, Average and Most Probable Velocities. Qualitative Discussion on Maxwell's Distribution of Molecular Velocities. Collision Properties: Collision Number, Mean Free Path, Collision Diameter and Collision Frequency. Liquefaction of Gases (based on Joule - Thomson effect).

Critical Phenomena: PV Isotherms of Real Gases, Continuity of States, van der Walls Equation, Isotherms of van der Waals Equation, Relationship between Critical Constants and van der Waals Constants, Law of Corresponding States, Reduced Equation of State.

Unit II. Liquid State.

Description and Structure of Liquids, Intermolecular Forces, Structural Differences between Solids, Liquids and Gases. Variation of Vapour Pressure of Liquids with Temperature, Trouton's Rule, Properties of Liquids (Surface Tension and Viscosity), Factors affecting the Surface Tension and Viscosity, Concept of Parachor, Measurements of Viscosity and Surface Tension.

Liquid Crystals, Vapour pressure-Temperature Diagram, Classification of Liquid Crystals, Difference between Liquid Crystals. Structure of Smectic, Nematic and Cholestric Liquid Crystals.

Unit III. Chemical Kinetics-I

Chemical Kinetics and its Scope, Rate of a Reaction, Rate Laws, Factors Influencing the Rate of Reaction: Concentration, Temperature, Pressure, Catalyst. Rate Constant, Elementary and Complex Reactions, Molecularity, Order of Reactions, Concentration and Temperature Dependence of Rates, Mathematical Characteristics of Simple Chemical Reactions - Zero Order, First Order, Second Order, Pseudo Order, and their Half-life Expressions. Determination of Order of Reaction - Differential Method, Method of Integration, Half-life Method and Isolation Method.

Books Recommended:

1. Essentials of Physical Chemistry, B.S. Bahl, G.D.Tuli and Arun Bahl, S. Chand & Company Ltd.
2. A Text Book of Physical Chemistry, A.S. Negi and S.C. Anand, New Age International Publishers.
3. Physical Chemistry, G. M. Barrow, International Student Edition, McGraw Hill.
4. Physical Chemistry through Problems, S. K. Dogra and S. Dogra Wiley Eastern Ltd.

31/10/14

(Dr. Tokeer Ahmad)

DEPARTMENT OF CHEMISTRY
JAMIA MILLIA ISLAMIA

MINUTES OF AN ORDINARY MEETING OF THE DEPARTMENT OF CHEMISTRY HELD ON 31st MARCH, 2015.

An ordinary meeting of the Department of Chemistry was held on **31st MARCH, 2015** at **3:30 p.m.** in the office of the Department of Chemistry. The following members attended the meeting:

Prof. Tabrez A. Khan (Chairperson)
Prof. Anwar Ali
Prof. Sharif Ahmed
Prof. Khalid Iftikhar
Prof. Amir Azam
Prof. Rabia Ahmad
Prof. Nahid Nishat
Prof. Imran Ali
Dr. Nasreen Majumdar
Dr. Ather A. Hashmi
Dr. Faqeer Mohammad
Dr. Saiqa Ikram
Dr. Tokeer Ahmad
Mr. Sapan Kumar Jain
Dr. Saif Ali Chaudhary
Dr. Rahisuddin
Dr. Ufana Riaz

Agenda Item No. 1:

The minutes of the last meeting of the Department held on 28th October 2014 were confirmed.

Agenda Item No. 2:

The examiners and moderators for B.Sc./M.Sc. classes for even semester examinations 2015 were appointed. The Board reiterated the appointment of Prof. Amir Azam as the Coordinator for B.Sc. semester examinations 2014-15. It was also decided that there will no external examiners from any private University/Institute/College.

Agenda Item No. 3:

The Head of Department was authorized to finalize the dates for theory and practical examinations of M.Sc. and practical examinations of B.Sc. classes.

Agenda Item No. 4:

The revision of the following papers of M.Sc IV semester was approved effective from the current academic session:

M.Sc. IV semester.....Chemistry of Natural Products.....Paper No. XVI

M.Sc. IV semester .....Organometallic Chemistry-II..... ..Paper No. XVII

The following paper was changed with effect from current session in place of Applications of Spectroscopy-II:

M.Sc. IV semester.....Reagents and Organic Synthesis ....Paper No. XVIII

Agenda Item No. 5:

The corrections in the Ph.D. thesis title of the following candidates were approved:

Name of Candidate	Old title	Corrected title	Supervisor(s)
Mohammad Naved Khan	Role of Soft **Template** in the Synthesis of Metal Nanoparticles	Role of Soft **Templates** in the Synthesis of Metal Nanoparticles	Tabrez Alam Khan Zaheer Khan (Co-supervisor)
Ommer Bashir	**Kinetics** and Mechanistic Studies of Advanced Nanomaterials	**Kinetic** and Mechanistic Studies of Advanced Nanomaterials	Zaheer Khan Tabrez Alam Khan (Co-supervisor)
Ummer Farooq	Study of Interactions of Ionic Liquids with Antidepressant Drugs and **Surfactant** in Aqueous Medium	Study of Interactions of Ionic Liquids with Antidepressant Drugs and **Surfactants** in Aqueous Medium	Anwar Ali

Agenda Item No. 6:

The allocation of supervisors for M.Sc. IV Semester project work was approved. It was decided that in future the supervisors for M.Sc. IV Semester project work shall be allocated just after the end of IIIrd semester examination. Further, it was decided that the concerned faculty members may give the requirements of chemicals just after the allocation of project students.

Agenda Item No. 7:

The progress reports of the research work done by the research scholars ending October 2014 were discussed, and were found satisfactory.

The meeting ended at **5:30 pm.**

Tabrez Alam Khan
Head

HEAD
DEPARTMENT OF CHEMISTRY
JAMIA MILLIA ISLAMIA
(CENTRAL UNIVERSITY)
NEW DELHI-110025

M. Sc. CHEMISTRY IVth SEMESTER
ORGANIC CHEMISTRY
Chemistry of Natural Products

PAPER XVI(iii)

Unit I: Alkaloids:
Introduction, Occurrence, Nomenclature, Classification based on nitrogen heterocyclic ring. Isolation, General methods of structure elucidation, Degradation, Physiological actions, Role of alkaloids in plants and their physiological action.

Synthesis of the following alkaloids:
Coniine. Ephedrine, Morphine and Quinine.

Unit II: Terpenoids:
Introduction, Occurrence, Classification, Nomenclature, Isolation, Isoprene rule, General methods of Structural Determination.
Synthesis of the following molecules:
Geraniol, α-Pinene, Camphor, Menthol, Phytol and Zingiberene.

Unit III: Flavonoids:
Introduction, Occurrence, Nomenclature, Isolation, General Methods of Structural Determination, Synthesis of Apigenin, Luteolin, Quercetin, Myrcetin, Diadzein, Vitexin, .Cyanidine and Hirsutidine.

Unit IV: Steroids:
Introduction, Occurrence, Nomenclature, Isolation, Basic skeleton, Diel's hydrocarbon and Stereochemistry, General Methods of Structural Determination.
Synthesis of the following steroids:
Aldosterone, Androsterone, Cholesterol, Estrone, Progesterone and Testosterone.

Books Recommended:

1. I.L. Finar, Organic chemistry, Vol. II, ELBS Publications, UK.
2. J. Mann, R.S. Devison, J.B. Hobbs, D.V. Banthrope and J.B. Harborne, Natural products chemistry and biological significance, Longman Publisher, Essex, UK.
3. B.A. Bohm, Introduction to flavonoids, Harwood Acad. Publishers, USA.

M.Sc. (Semester – IV)

Organometallic Chemistry (Paper – XVII)

Unit – I: Fluxionality & Dynamic Equalibria

- Stereo-chemical non-rigidity in organometallic complexes,
- Scrambling of carbonyl groups in metal carbonyl complexes
- Fluxionality and dynamic equalibria in olefinic, π-allyl and cyclopentadienyl complexes
- Ring whizzing
- Davies-Green-Mingo (DMG) Rules

Unit- II: Distinctive Organometallic Reactions

- Oxidative addition reactions (d^{10}, $d^8$and d^7 complexes), Intramolecular oxidative addition reactions, C-H activation, cyclo-metallation and ortho-metallation, oxidative coupling reactions
- Reductive elimination reactions (mono & binuclear systems), α and β elimination reactions, β hydrogen elimination / β-hydrogen transfer reactions
- Insertion reactions, insertion of carbonyls and alkene sand migratory insertion reactions

Unit – III: Compounds of Transition Metal-Carbon Multiple Bonds.

- Transition metal carbenes, Fischer carbene & Schrock's carbenes their requisites and properties, Tebbe's reagent

- Intermediate carbenes between Fischer & Schrock carbene, Grubb's catalyst Ist & 2nd generation catalyst and its applications
- Transition metal carbyne complexes , their preparation properties and structures

Unit – IV: Industrial Applications of Organometallic Complexes

- Catalytic applications of organometallic complexes
- Alkene hydrogenation and Wilkinson catalyst
- Synthesis gas (H_2/CO) formation
- Monsanto –Acetic acid process
- Hydroformylation reactions
- Wacker Oxidation process and isomerisation
- Polymerization and Ziegler-Natta catalysis

Books Recommended

- Organometallic Chemistry (Second Edition) Gary O. Spessard and Gary L. Miessler; Oxford University Press Publication Date - October 2009
- Organometallic Chemistry; Prof Kenneth D Karlin; John Hopkins University; Spring 2010 (www.jhu.edu/~chem/karlin)
- The Organometallic Chemistry of Transition Metals - Robert H Crabtree , Wiley
- Metallo-organic Chemistry- Anthony J Pearson, John Wiley & Sons Inc, (1985)
- Organotransition Metal Chemistry: From Bonding to Catalysis – John Hartwig; University Science Books – November 30, 2009
- Inorganic Chemistry – Principles of Structure & Reactivity, J E Huhey, Elllen A Keiter & Richard L Keiter, IV Edition (2005)
- Introduction to Metal Pi-Complex Chemistry- M. Tsutsui, M.N. Levy, A. Nakamura, M. Ichikawa and K. Mori, Plenum Press, New York I Heme (1970).
- Organometallic Chemistry - R. C. Mehrotra & A. Singh, Wiley Eastern Ltd. (2000)
- Advanced Inorganic Chemistry - F Albert Cotton, Geoffrey Wilkinson, Carlos A Murillo & Manfred Bochmann, VI Edition, John Wiley & Sons Inc (1999)

M. Sc. CHEMISTRY IVth SEMESTER
ORGANIC CHEMISTRY
Reagents and Organic Synthesis
PAPER - XVIII(III)

Unit-1. Asymmetric Synthesis

Nature is asymmetrical

Resolution can be used to separate enantiomers,

The Chiral Pool – Nature's 'ready-made' chiral centres

Asymmetric Synthesis – Chiral reagents and chiral catalysts.

Unit-2. Protecting of the following groups:

Principles of protection of carbon-carbon double bonds, alcohol, amine, carbonyl and carboxyl groups.

Unit-3 Disconnection approach to synthesis of organic molecules:

An introduction to synthons and synthetic equivalents, conversion and interconversion of functional groups, selective reactions(chemo-, region-, and stereoselective), formation of C-C, C-O, C-N bonds.

Unit-4 (a) One Group C-C Disconnection:

Alcohols and carbonyl compounds, consideration of regioselectivity. Alkene synthesis and uses of acetylenes in organic synthesis.

(b) Two Group C-C Disconnection:

Diels Alder reaction, 1,3-difunctionalised compounds, α,β-unsaturated carbonyl compounds, 1,5-difunctionalised compounds. Michael addition and Robinson Annulation.

Books Recommended

1. L.F. Fieser and M. Fieser, *Reagents for Organic Synthesis,* Vol. 1-16 (Vol. 1, 1967), Wiley-Interscience, New York.
2. M.B. Smith and J. March, *March's Advanced Organic Chemistry – Reactions, Mechanisms & Structure*, 5th ed. (2001), Wiley-Interscience, New York.
3. M. B. Smith, *Organic Synthesis,* McGraw Hill Inc., New York (1995).
4. J. Clayden, N. Greeves, S. Warren, and E. Wothers, *Organic Chemistry,* Oxford Univ. Press,

M. Sc. CHEMISTRY III[rd] SEMESTER
ORGANIC CHEMISTRY
APPLICATION OF SPECTROSCOPY
Paper XIV(iii)

Unit 1: Ultraviolet and Visible Spectroscopy

Various electronic transitions (185-800 nm), Beer-lambert law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds.

Unit 2: Infra red Spectroscopy

Instrumentation and sample handling, Effects of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance, Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines.

Unit 3: Nuclear Magnetic Resonance Spectroscopy

General introduction and definition, chemical shift, spin-spin interaction, shielding mechanism, mechanism of measurement, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic, alcohols, phenols, enols, carboxylic acids, amines, amides and mercapto), chemical exchange, effect of deuteration, complex spin-spin interaction between two, three, four and five nulei (first order spectra), virtual coupling. Simplification of complex spectra- nuclear magnetic double resonance, contact shift reagents, solvent effects. Fourier transform technique, nuclear Overhauser effect (NOE). Resonance of other nuclei-F, P., Introduction of Carbon-13 NMR Spectroscopy.

Unit 4: Mass Spectrometry

Introduction, ion production-El, Cl, FD and FAB, factors effecting fragmentation, ion analysis, ion abundance, Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement, Nitrogen rule, High resolution mass spectrometery. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

Books Suggested:

1. Carruthers, W, Modern Methods of Organic Synthesis Cambridge University Press.
2. Kemp, W, Organic Spectroscopy , W.H. Freeman & Co.
3. R. M. Silverstein, G. C. Bassler and T. C. Morrill, Spectroscopic Identification of Organic Compounds, John Wiley & Sons.

DEPARTMENT OF CHEMISTRY
JAMIA MILLIA ISLAMIA

MINUTES OF AN ORDINARY MEETING OF THE BOARD OF STUDIES OF THE DEPARTMENT OF CHEMISTRY HELD ON 18th SEPTEMBER, 2015.

An ordinary meeting of the Department of Chemistry was held on 18th SEPTEMBER, 2015 at 3:30 p.m. in the office of the Department of Chemistry. The following members attended the meeting:

Prof. Tabrez A. Khan (Chairperson)
Prof. Anwar Ali
Prof. Khalid Iftikhar
Prof. Amir Azam
Prof. Rabia Ahmad
Prof. Nahid Nishat
Dr. Faqeer Mohammad
Dr. Saiqa Ikram
Dr. Nasimul Hoda
Dr. Tokeer Ahmad
Mr. Sapan Kumar Jain
Dr. Rahisuddin
Dr. Ufana Riaz

Agenda Item No. 1:

The minutes of the meeting of the Board of Studies (BoS) of the Department held on 07th April, 2015 were confirmed. However, the minutes of the meeting of the BoS dated 3-4 September, 2015 were confirmed after deleting the co-supervisor of the candidate Mr. Md. Ikbal Ahmad Talukdar at S. No. 1 in the list of candidates recommended by BoS for admission to Ph.D. in Chemistry.

Agenda Item No. 2:

(a) The courses/credits and syllabi of B.Sc (Hons)/BSc Chemistry Ist semester and M.Sc (Chemistry) Ist and IInd semesters under CBCS were considered and approved.

(b) The revised syllabi of the following papers were considered and approved with effect from the current academic session 2015-16:

(i) B.Sc (Hons) Chemistry V semester (CH-501) …Inorganic Chemistry (Paper No. XIX)

(ii) B.Sc (Hons) Chemistry VI semester (CH-601)…Inorganic Chemistry (Paper No. XIII)

(iii) B.Sc (Hons) Chemistry V semester (CH-601)...Organic Chemistry ((Paper No. XVI)

(iv) B.Sc (Hons) Chemistry V semester ..... Organic Chemistry Practical

Agenda Item No. 3:

The examiners and moderators for B.Sc/M.Sc classes for odd semester examinations 2015-16 were appointed.

Supplementary Agenda:

(a) The Board co-opted the following as External member of Board of Studies of the Department of Chemistry for a period of three years:

1. Prof. Nizamuddin Khan, Department of Chemistry, DDU Gorakhpur University, Gorakhpur

2. Prof. Bachcha Singh, Department of Chemistry, Banaras Hindu University, Varanasi

(b) On the recommendation of Dr. Faqeer Mohammad (supervisor) the Board approved the correction in the Ph.D. thesis title of his research scholars as under:

Name of research scholar	Old title	Corrected title
Shahid-ul-Islam	Development of Shades on Wool with Annato (Bixa orellana), Teak (Tectona grandis) and Flame of Forest (Butea monosperma) natural dyes and their characteristics evaluation	Development of Shades on Wool with Annatto (*Bixa orellana*), Teak (*Tectona grandis*), and Flame of the Forest (*Butea monosperma*) Natural Dyes and their Characteristics Evaluation
Mohd. Shabbir	Development of shades on wool with *Alkanna tincoria* (Alkanet), *Terminalia chebula* (Harda), and *Tagetes erecta* (Marigold) natural dyes and their characteristics evaluation	Development of Shades on Wool with *Alkanna tincoria* (Alkanet), *Terminalia chebula* (Harda), and *Tagetes erecta* (Marigold) Natural Dyes and their Characteristics Evaluation

The meeting concluded at 4:30 pm with vote of thanks to the Chair.

Tabrez Alam Khan
Head

HEAD
DEPARTMENT OF CHEMISTRY
JAMIA MILLIA ISLAMIA
(CENTRAL UNIVERSITY)
NEW DELHI-110025

DEPARTMENT OF CHEMISTRY
JAMIA MILLIA ISLAMIA

MINUTES OF AN ORDINARY MEETING OF THE BOARD OF STUDIES OF THE DEPARTMENT OF CHEMISTRY HELD ON 22 SEPTEMBER, 2017

An ordinary meeting of the Board of Studies of the Department of Chemistry was held on 22nd September, 2017 (Friday) at 3-00 pm at the Lecture Theatre of the department. The following members attended the meeting:

1. Prof. Amir Azam (Chair)
2. Prof. Tabrez A. Khan
3. Prof. Khalid Iftikhar
4. Prof. Rabia Ahmad
5. Prof. Nahid Nishat
6. Prof. Imran Ali
7. Prof. Nasreen Mazumdar
8. Dr. Saiqa Ikram
9. Dr. Tokeer Ahmad
10. Mr. Sapan Kumar Jain
11. Dr. Saif Ali Chaudhry
12. Dr. Rahisuddin
13. Dr. Ufana Riaz
14. Dr. Rashid Ali

Agenda Item No. 1 (*Confirmation of the minutes of the previous meetings*)

The minutes of the last two meetings of the Board of Studies of the Department held on 24th March and 26th April, 2017 were confirmed.

Agenda Item No. 2 (*CBCS structure and syllabus*)

The CBCS structure and syllabi of B.Sc. (Hons.), B.Sc. and B.Sc (Subs.) were discussed at length and approved. It was decided that as per UGC CBCS course structure, Inorganic Chemistry–II paper (theory and practical) in B. Sc. (Hons) IInd semester will be replaced with Physical Chemistry–II (theory and practical) w.e.f. 2017-2018 session.

The board also came to the conclusion that the department will seek funds to start the project work in B. Sc. (Hons.) VI semester; however, in case of unavailability of funds, the department will continue with the practice of holding the grand viva.

Agenda Item No. 3 (*Ph.D related matters*)

(i) The continuation of non-NET fellowship for the fourth year of the following students was considered and approved:

S. No.	Name	Date of registration	Supervisors
1.	Jyoti Gupta	01-10-2014	Prof. Amir Azam
2.	Mudasir Nabi Peerzada	01-10-2014	Prof Amir Azam
3.	Sajid Iqbal	13-10-2014	Prof. Sharif Ahmad
4.	Abdul Kareem	30-09-2014	Prof. Nahid Nishat
5.	Sajjad Hussain Parrey	30-09-2014	Prof. Rabia Ahmad
6.	Ovas Ahmad Dar	30-09-2014	Prof. Athar Adil Hashmi

(ii) The minor change in the Ph. D. topic of Ms. Shabnam Khan (Supervisor: Prof. Nahid Nishat) was considered and approved with the following details.

Old topic: "Synthesis, characterization and biomedical applications of cashew nut shell liquid-metal ion complexes and their coordination polymers"

Approved New topic: "Synthesis, characterization and applications of cashew nut shell liquid derived coordination polymers"

(iii) The request for the cancellation of Ph. D. registration of **Ms. Veenu** (supervisor: Dr. Tokeer Ahmad), **Ms. Sania Sheikh** (supervisor: Dr. Rahisuddin) and **Mr. Asif Ali Qureshi** (supervisor: Prof. Imran Ali and co-supervisor: Dr. Tokeer Ahmad), recommended by their supervisors, was considered by the board and the board recommended that the admission of these students be cancelled.

(iv) The requests for one year extension in the Ph. D. registration of the following students were placed before the board for consideration. The board considered their requests and recommended the extension for one more year.

S. No.	Name	Date of registration	Extension w.e.f.	Supervisors
1.	Showkat Ali Ganie	19-09-2012	19.09.2017	Prof. Nasreen Mazumdar
2.	Mohd. Shahazad	18-09-2012	18.09.2017	Dr. Tokeer Ahmad

(iv) Inclusion of Prof. Sharif Ahmad's name as the co-supervisor of Ashiq Hussain Pandit, a Ph. D. student of the department was discussed and approved by the board subject to the submission of written consent by Prof Sharif Ahmad.

Agenda Item No. 4 (*Educational Tour*)

The board discussed about the educational tours of UG & PG of the department and came to this conclusion, since the tour is neither the part of UGC CBCS course curriculum nor it is approved in the credit course structure of JMI at UG and PG levels; hence, the tour is scraped with immediate effect. The credits distribution and course structure will be followed as per UGC CBCS curriculum and UG and PG credit tables approved by JMI.

Agenda Item No. 5 (*Any other item with the permission of chair*)

Prof Khalid Iftikhar informed the board that some experiments in M. Sc. Inorganic Chemistry practical are being conducted and are not the part of present syllabus. The board agreed to include the suggested practicals. The board also agreed for the inclusion of the sentence "Any other practical introduced in the session" at the end of all chemistry laboratory courses.

The meeting came to an end at 5-00 pm.

3/10/17

(Prof. Amir Azam)
Acting Head
Department of Chemistry
Jamia Millia Islamia
110025

MINUTES OF AN EMERGENCY MEETING OF BOARD OF STUDIES OF THE DEPARTMENT OF CHEMISTRY HELD ON 15 NOVEMBER, 2018

An emergency meeting of the Board of Studies of the Department of Chemistry was held on 15th November, 2018 (Thursday) at 3:30 pm in the Committee Room of the department. The following members attended the meeting:

1. Prof. Amir Azam (Chair)
2. Prof. Ayub Khan
3. Prof. Sharif Ahmad
4. Prof. Tabrez A. Khan
5. Prof. Khalid Iftikhar
6. Prof. Rabia Ahmad
7. Prof. Nahid Nishat
8. Prof. Athar A. Hashmi
9. Prof. Nasimul Hoda
10. Dr. Saif Ali Choudhry
11. Dr. Tokeer Ahmad
12. Dr. Saiqa Ikram
13. Mr. Sapan Kumar Jain
14. Dr. Ufana Riaz

Agenda: Change in syllabus of B. Sc. (H) SEM-V CBCS paper

The Board members were informed by the chairman that the discussion on the change in syllabus of BSc.(H) Sem-V CBCS paper was inadvertently missed which was to be approved in the previous BOS Meeting. The CBCS paper entitled "Molecular modeling and drug design" was changed to "Separation Techniques in Chemistry".

The chairman informed that the BSc. (H) Sem-V students had not opted the molecular modeling paper. He also pointed out that under present circumstances; it was difficult to conduct the practicals related to molecular modeling paper due to non availability of computer facility at the department. He ensured that the molecular modeling paper would be taught in future only after procuring the necessary infrastructure of practical laboratory required for the said paper.

The meeting came to an end at 4:00 pm with the vote of thanks to chair.

(Prof. Amir Azam)

HEAD
DEPARTMENT OF CHEMI
JAMIA MILLIA ISLAMI
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NEW DELHI-110025

Semester-II
Paper No: V-H
Paper Code: BCH-203

UE = 75 marks
IA = 25 marks

Physical Chemistry-II

Unit I. Thermochemistry

Exothermic and endothermic reactions, Heats of reactions, standard states, relation between heat of reaction at contant volume (q_v) and at contant pressure (q_p), Heat capacity, relation between Cp and Cv, laws of thermochemistry, enthalpy of formation, heat of solution and dilution, heat of neutralization, bond dissociation energy, bond energy and its calculation, concept of lattice energy, effect of temperature (Kirchhoffôs equations) and pressure on enthalpy of reactions.

Unit II. Thermodynamics

Introduction: System, surroundings, intensive and extensive properties, isolated, closed and open systems; thermodynamic processes, state and path functions. First law of thermodynamics: Concept of heat (q), work (w), internal energy (U), and statement of first law; concept of carnot cycle, calculations of q, w, U and H for reversible, irreversible and free expansion of gases under isothermal and adiabatic conditions.Second Law: Spontaneous process, Criteria of spontaneity, concept of entropy and statements of second law of thermodynamics, Calculation of entropy change for reversible and irreversible processes. Entropy change for isolated systems and entropy change in phase transitions.Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy from heat capacity data.Gibbs free energy and spontaneity; free energy and work function, variation of free energy with temperature and pressure. Gibbs-Helmholtz equation, Clausius-Clapeyron equation and Maxwell relations.

Unit III. Chemical Equillibrium

Reversible and irreversible reactions, Characteristics of chemical equilibrium, Formulation of equilibrium law, equilibrium law for ideal gases, relation between Kp and Kc and Kx. Reaction quotient, factors affecting the equilibrium constant. Equilibrium between gases and solids, equilibrium constant for a system of real gases, equilibrium constant of reactions in solution. Thermodynamic treatment of equilibrium constant. Variation of equilibrium constant with temperature, pressure and concentration, effect of inert gas on reaction equilibrium, Le ï Chatelierôs principle.

Unit IV. Solutions and Colligative Properties

Methods of expressing concentrations of solutions, Dilute solution, colligative properties, Raoults law, relative lowering of vapour pressure, Experimental method for measuring the lowering of vapour pressure, molecular weight determination. Osmosis, Law of osmotic pressure, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Abnormal molar mass, degree of dissociation and association of solutes.

Books Recommended

2. Essentials of Physical Chemistry, B.S. Bahl, G.D.Tuli and Arun Bahl, S. Chand & Company Ltd.
6. A Text Book of Physical Chemistry, A.S. Negi and S.C. Anand, New Age International Publishers.
7. Physical Chemistry, G. M. Barrow, International Student Edition, McGraw Hill.
8. Physical Chemistry through Problems, S. K. Dogra and S. Dogra Wiley Eastern Ltd.
9. Physical Chemistry, P. W. Atkins, & J. de Paula, 10th Ed., Oxford University Press (2014).

Practical Code: BCH-203L

UE = 25 marks
IA = 25 marks

Physical Chemistry Practical-II

1. Determination of the heat capacity of a calorimeter.
2. Determination of heat capacity of the calorimeter and integral enthalpy (endothermic and exothermic) of solution of salts.
3. To determine the enthalpy of neutralization of a weak acid / weal base versus strong base/ strong acid and determine the enthalpy of ionisation of the weak acid / weak base.
4. To determine the enthalpy of hydration of $CuSO_4$.
5. To study of the solubility of benzoic acid in water and determination of ΔH.
6. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber Cycle.
7. Verification of Hessôs law by utilizing the enthalpy of neutralization of (i) HCl (aq), (ii) NaOH(s) + HCl(aq), and (iii) enthalpy of solution of NaOH(s) in water.
8. Determination of basicity of a polyprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.
9. Determination of the molar mass of the given solute by using Rast method.
10. **Any other experiment carried out in the class.**

Reference Books

1. O.P. Pandey, D.N. Bajpai & S. Giri, Practical Chemistry, S. Chand & Company Ltd.
2. B. D. Khosla, V. C. Garg & A. Gulati, *Senior Practical Physical Chemistry,* S. Chand & Co.: New Delhi (2011).
1. C. W. Garland, J.W. Nibler, & D.P. Shoemaker, *Experiments in Physical Chemistry 8th Ed*.; McGraw-Hill: New York (2003).
2. A.M. Halpern & G.C. McBane, *Experimental Physical Chemistry 3rd Ed.;* W.H. Freeman & Co.: New York (2003).

Semester-V
Paper No: XVI-H
Paper Code: BCH-502

UE = 75 marks
IA = 25 marks

Organic Chemistry-IV

Unit-I Amino Acids, Peptides and Proteins Amino acids

Peptides and their classification:Ŭ-Amino Acids ï stereochemistry, Synthesis, chromatographic separation, ionic properties and reactions. Zwitterions, pKa values, isoelectric point and electrophoresis. Resolution of racemic aminoacids, Study of peptides: determination of their primary structures-end group analysis, methods of peptide synthesis. Synthesis of peptides using N-protecting, C-protecting and C-activating groups -Solid-phase synthesis.Primary Secondary and tertiary structure of proteins.

Unit-II Nucleic Acids

Components of nucleic acids, Nucleosides and nucleotides; Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil and Thymine;Structure of polynucleotides. DNA and RNA ï Base pair formation and double helical structure.Comparison of structural stability.

Unit-III Carbohydrates

Occurrence, classification and their biological importance;Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; KillianiFischer synthesis and Ruff degradation; Disaccharides ï Structure elucidation of maltose, lactose and sucrose.; Polysaccharides ï Elementary treatment of starch, cellulose and glycogen.

Unit-IV Lipids

Introduction to oils and fats; common fatty acids present in oils and fats,
Saturated and unsaturated fatty acids.Classification of unsaturated fatty acids. Melting and boiling point of fatty acids. Hydrogenntion and Freeradicalreactions of fats and oils; Saponification value, acid value, iodine number; Reversion and rancidity.

Reference Books

1. Finar, I. L. *Organic Chemistry* (*Volume 1& ll*), Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).

Semester-V
Paper No: XVI-H
Paper Code: BCH-502

UE = 75 marks
IA = 25 marks

Organic Chemistry-IV

Unit-I Amino Acids, Peptides and Proteins Amino acids

Peptides and their classification:Ŭ-Amino Acids ï stereochemistry, Synthesis, chromatographic separation, ionic properties and reactions. Zwitterions, pKa values, isoelectric point and electrophoresis. Resolution of racemic aminoacids, Study of peptides: determination of their primary structures-end group analysis, methods of peptide synthesis. Synthesis of peptides using N-protecting, C-protecting and C-activating groups -Solid-phase synthesis.Primary Secondary and tertiary structure of proteins.

Unit-II Nucleic Acids

Components of nucleic acids, Nucleosides and nucleotides; Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil and Thymine;Structure of polynucleotides. DNA and RNA ï Base pair formation and double helical structure.Comparison of structural stability.

Unit-III Carbohydrates

Occurrence, classification and their biological importance;Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; KillianiFischer synthesis and Ruff degradation; Disaccharides ï Structure elucidation of maltose, lactose and sucrose.; Polysaccharides ï Elementary treatment of starch, cellulose and glycogen.

Unit-IV Lipids

Introduction to oils and fats; common fatty acids present in oils and fats,
Saturated and unsaturated fatty acids.Classification of unsaturated fatty acids. Melting and boiling point of fatty acids. Hydrogenntion and Freeradicalreactions of fats and oils; Saponification value, acid value, iodine number; Reversion and rancidity.

Reference Books

1. Finar, I. L. *Organic Chemistry* (*Volume 1& ll*), Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).

Practical Code: BCH-502L

UE = 25 marks
IA = 25 marks

Organic Chemistry Practical-IV

1. Estimation of glycine by Sorensonôs formalin method.
2. Study of the titration curve of glycine.
3. Estimation of proteins by Lowryôs method.
4. Study of the action of salivary amylase on starch at optimum conditions.
5. Effect of temperature on the action of salivary amylase.
6. Saponification value of an oil or a fat.
7. Determination of Iodine number of an oil/ fat.
8. Isolation and characterization of DNA from onion/ cauliflower/peas.

Reference Books

1. Manual of Biochemistry Workshop, 2012, Department of Chemistry, Universityof Delhi.
2. Arthur, I. V. *Quantitative Organic Analysis,* Pearson.

Semester-VI
Paper No: XVIII-H
Paper Code: BCH-601

UE = 75 marks
IA = 25 marks

Inorganic Chemistry-V

Unit-I Organometallic Compounds

Definition and classification of organometallic compounds on the basis of bond type. Concept of hapticity of organic ligands.Metal carbonyls: 18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series.Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT.´-acceptorbehaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.Zeiseôs salt: Preparation and structure, evidences of synergic effect and comparison of synergic effect with that in carbonyls.

Unit-II Catalysis by Organometallic Compounds

Study of the following industrial processes and their mechanism: Alkene hydrogenation (Wilkinsons Catalyst), Hydroformylation (Co salts),Wacker Process, Synthetic gasoline (Fischer Tropsch reaction),Synthesis gas by metal carbonyl complexes.

Unit-III Reaction Kinetics and Mechanism

Introduction to inorganic reaction mechanisms. Substitution reactions in square planar complexes, Trans- effect, theories of trans effect, Mechanism of nucleophilic substitution in square planar complexes, Thermodynamic and Kinetic stability, Kinetics Aspects of Metal Complexes, Kinetics of octahedral substitution, Ligand field effects and reaction rates, Mechanism of substitution in octahedral complexes.

Unit-IV Bioinorganic Chemistry

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals.Sodium / K-pump, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine. Iron and its application in bio-systems, Haemoglobin; Storage and transfer of iron.

Reference Books

1. Huheey, J. E.; Keiter, E.A. &Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity, 4th Ed., Harper Collins 1993, Pearson, 2006.
2. Sharpe, A.G., Inorganic Chemistry, 4th Indian Reprint (Pearson Education) 2005.
3. Lee, J.D. Concise Inorganic Chemistry 5th Ed., John Wiley and sons 2008.
4. Powell, P. Principles of Organometallic Chemistry, Chapman and Hall, 1988.
5. Shriver, D.D. & P. Atkins, Inorganic Chemistry 2nd Ed., Oxford University Press,1994.
6. Purcell, K.F. &Kotz, J.C., Inorganic Chemistry, W.B. Saunders Co. 1977.
7. Miessler, G. L. &Tarr, D.A. Inorganic Chemistry 4th Ed., Pearson, 2010.
8. S.J. Lippard and J.M. Berg, Principles of Bioinorganic Chemistry, University Science Books.