ANNEXURE H

FACULTY OF SCIENCES

SYLLABUS FOR THE

SUBJECT: CHEMISTRY

For the award of the Degree in

Master of Science (Physics) (FYIP)

(Credit Based Continuous Evaluation Grading System)

Under NEP-2020

Semester I-II

Session: 2025-26

The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR
(AUTONOMOUS)

KANYA MAHA VIDYALAYA JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF FIVE YEAR INTEGRATED PROGRAMME

Master of Science (Physics) (FYIP)
Credit Based Continuous Evaluation Grading System (CBCEGS)
(Session: 2025-26)

Master of Science (Physics) (FYIP) (Semester I)										
Course Name	**Hours Per Week L-T-P**	**Credits L-T-P**	**Course Code**	**Course Type**	**Total marks**	**Paper**	**Ext.**		**CA**	**Examination Time (in Hours)**
							L	**P**		
Chemistry	3-0-0	3-0-0	FPHL-1086	**C**	100	Organic Chemistry (Theory)	70	-	30	3
	0-0-2	0-0-1	FPHP-1088	**C**	50	Organic Qualitative Analysis (PRACTICAL)	-	35	15	3

Master of Science (Physics) (FYIP)

Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2025-26)
(Semester I)
COURSE CODE: FPHL-1086

COURSE TITLE: ORGANIC CHEMISTRY
(THEORY)

Course outcomes:

Students will be able to

CO1: learn about the basic chemistry of organic chemistry.

CO2: interpret the reactions and properties of alcohols and Phenols and provide basic knowledge of organic reaction mechanisms.

CO3: understand preparations and reactions of ethers and epoxides, understand cleavages in ethers, the ring opening reactions of epoxides.

CO4: to resolve the different enantiomers and differentiate between dextrorotatory-leavorotatory chiral and achiral compounds, understand the concept of isomerism, conformation and configuration.

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Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2025-26)
(Semester I)
COURSE CODE: FPHL-1086
COURSE TITLE: ORGANIC CHEMISTRY
(THEORY)

Exam Time: 3Hrs. **Max. Marks: 100**
Credit(L-T-P): 3-0-0 **(Theory: 70, CA: 30)**

Instructions for the Paper Setters: Eight questions of equal marks (Fourteen marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Basics concepts of Organic Chemistry: Classification and Nomenclature of organic compounds. Electronic Effects: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation. Reactive intermediates: carbocations, carbanions, free radicals. Electrophiles and Nucleophiles. Nucleophilicity and basicity. Relative strengths of acids and bases, concept of p*K*a, effect of substituents and steric effects of substituents.

SECTION-B

Chemistry of functional groups–I: Selective methods of preparation: dehydration of alcohols, dehydrohalogenation of alkyl halides with complete mechanistic discussion. (E mechanism), Saytzeff's rule. Reactions: addition of hydrogen halides (Markovnikov's and anti-Markovnikov's addition), halogen addition to alkenes, epoxidation of alkenes. Acidity of acetylene, Birch reduction, addition of hydrogen halides and water to alkynes, Diels-Alder reaction.

SECTION-C

Chemistry of functional groups–II: Ethers and Epoxides: methods of their formation, Chemical reactions Cleavage and autoxidation, Zeisel's method, Acids and base catalysed ring opening of epoxide, Alkyl Halides, Types of Nucleophilic Substitution (SN1, SN2) reactions, solvent effect, substitution and elimination as competing reactions. Principles of nucleophilic addition to carbonyl groups: acetal formation, cyanohydrins formation; reactions with primary and secondary amines, Witting reaction, aldol condensation.

SECTION-D

Stereochemistry: Introduction, Conformations of ethane and butane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Configuration: Geometrical and Optical isomerism, Molecular chirality, optical activity, absolute and relative configuration, the Cahn-Ingold Perlog R-S notional system, physical properties of enantiomers, naming stereo isometric alkenes by the E/Z system.

Books suggested

1. R.T. Morison and R.N Boyd, Organic Chemistry.
2. I.L. Finar, Organic Chemistry, Vol. I- IV
3. J. March, Advanced Organic Chemistry, Reactions Mechanism and Structure.
4. F.A. Carey, Organic Chemistry.

Master of Science (Physics) (FYIP)

Credit Based Continuous Evaluation Grading System (CBCEGS)
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(Semester I)
COURSE CODE: FPHP-1088
COURSE TITLE : Qualitative Organic Analysis
(Practical)

Course outcomes:

Students will be able to analyze the given organic compound through

CO1:understand the basics of Qualitative analysis

CO2: detection of elements (N, S and halogens) in organic compounds.

CO3:detection of functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines,amides, nitro and anilide) in simple organic compounds

CO4: preparation of their derivatives

Master of Science (Physics) (FYIP)

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(Under NEP 2020)
(Session: 2025-26)
(Semester I)
COURSE CODE: FPHP-1088
COURSE TITLE : Qualitative Organic Analysis
(Practical)

Time: 3 Hrs **Marks: 50**
Credits: 0-0-1 **(Practical: 35, CA: 15)**

The preliminary examination of physical and chemical characteristics (Physical state, colour and odour), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine), solubility tests including acid-base reactions, classification tests involving functional reactivity other than acid-base test. The following categories of compounds should be analysed phenols, carboxylic acids, carbonyl compounds- ketones and aldehydes, aromatic amines, amides.

Books Suggested

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5 th Ed. Pearson (2012)
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
4. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

KANYA MAHA VIDYALAYA JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF FIVE YEAR INTEGRATED DEGREE PROGRAMME

Master of Science (Physics) (FYIP)
Credit Based Continuous Evaluation Grading System (CBCEGS)
(Session: 2025-26)

Master of Science (Physics) (FYIP) (Semester II)										
Course Name	**Hours Per Week L-T-P**	**Credits L-T-P**	**Course Code**	**Course Type**	**Total marks**	**Paper**	**Ext.**		**CA**	**Examination Time (in Hours)**
							L	**P**		
Chemistry	3-0-0	3-0-0	FPHL-2086	**C**	100	Inorganic Chemistry	70	-	30	3
	0-0-2	0-0-1	FPHP-2088	**C**	50	Inorganic Chemistry Lab	-	35	15	3

Master of Science (Physics) (FYIP)
Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2025-26)
(Semester II)
COURSE CODE: FPHL-2086
COURSE TITLE: Inorganic Chemistry

Course Outcomes:

Students will be able to

CO1: Describe VBT, VSEPR theory and predicts the geometry of simple molecules & molecular orbital theory of homonuclear diatomic molecules, explain, predict & draw structures of simple ionic compounds.

CO2: To enrich the factual knowledge of chemistry related to theories of coordination complexes and calculation of C.F.S.E.

CO3: To develop an understanding of the concepts of structure and bonding of inorganic complexes and calculate microstates and spectroscopic terms.

CO4: To familiarize with π-acid ligands.

Master of Science (Physics) (FYIP)

Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2025-26)
(Semester II)
COURSE CODE: FPHL-2086
COURSE TITLE: Inorganic Chemistry

Exam Time: 3Hrs. **Max. Marks: 70**
Credit(L-T-P): 3-0-0 **(Theory: 70, CA: 30)**

Instructions for the Paper Setters: Eight questions of equal marks (Fourteen marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section

UNIT-I

Introduction, Werner's coordination theory, naming of co-ordinate complexes. Co-ordination numbers 1-12 and their stereo-chemistries. Factors affecting co-ordination number and stereochemistry. Configurational Isomers, Conformational isomerism, VSPER theory, molecular orbital theory applied to homo-nuclear diatomic molecules. Bonding in metal complexes, Valence bond theory for co-ordinate complexes, inner and outer orbital complexes, Electro-neutrality and back bonding, limitations of V.B. theory.

UNIT-II

Stability of coordination compoundsIntroduction, Stability constant, stepwise stability constant, overall stability constant. Factors affecting the stability of metal ion complexes with general ligands, HSAB principle.Crystal field theory- Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planar fields of ligands. Calculation of C.F.S.E. in high spin and low spin octahedral and High spin tetrahedral complexes, factors affecting the 10 Dq Value. Structural effects of crystal field splitting- Jahn-Teller distortion, variation of Ionic radii with increase in atomic number. Paramagnetism, diamagnetism, ferro and anti ferromagnetism.

UNIT-III

Microstates and spectroscopic terms, a calculation of spectroscopic terms for d1 - d10 electronic configurations, L S coupling, Hund's rule for finding the ground state terms, Electronic spectral properties of Ist transition series, Orgel Diagrams for d1 - d10 systems, for weak field octahedral and tetrahedral complexes, limitations of C.F.T.

UNIT-IV

π -Acid Ligands definition Carbon monoxide complexes, bonding in linear MCO groups, polynuclear metal carbonyls, vibrational spectra, carbonyl hydrides and halides. Metal-metal bonding, metal metal multiple bonding, Structure of high nuclearity carbonyl clusters, counting of electrons in carbonyl clusters.

Reference Books:

1. J.E. Huheey, Inorganic Chemistry, 3rd Ed.
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry.
3. B.E. Douglas and D.H. McDaniel, Concepts and Models of Inorganic Chemistry.

Master of Science (FYIP) Physics

Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2025-26)
(Semester II)
COURSE CODE: FPHP-2088
COURSE TITLE : Inorganic Chemistry Lab

Course outcomes

Students will be able

CO1: To develop technical skills relevant to quantitative analysis.

CO2: Will have knowledge of cationa and anions.

CO3: To separate and identify the various ions present in the mixture.

CO4: To perform confirmatory tests of various ions present in the mixture.

Master of Science (FYIP) Physics

Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2025-26)
(Semester II)
COURSE CODE: FPHP-2088
COURSE TITLE : Inorganic Chemistry Lab

Time: 3 Hrs **Marks: 50**

Credits: 0-0-1 **(Practical: 35, CA: 15)**

1. Identification of cations and anions in a mixture which may contain four ions (cations and anions).

2. Perform systematic group analyses to identify the cations in the mixture. Any cation from Group I, Group II (Group IIA and IIB) Group IV, Group V and Group VI may be present.

Reference Books:

Vogel's book on Inorganic Qualitative Analysis