



# UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)  
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section

Email: [academicsectionju14@gmail.com](mailto:academicsectionju14@gmail.com)

## NOTIFICATION (23/July/Adp./53)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Studies in the subject of **Chemistry** of Semester **IIIrd** and **IVth** for **Four Year Under Graduate Programme (FYUGP)** under the **Choice Based Credit System** as per **NEP-2020 (as given in the annexure)** for the examinations to be held in the years as per the details given below:

Subject	Semester	For the examinations to be held in the year
Chemistry	Semester- III	Dec. 2023, 2024 and 2025
	Semester-IV	May 2024, 2025 and 2026

The Syllabi of the courses is also available on the University website: [www.jammuuniversity.ac.in](http://www.jammuuniversity.ac.in).

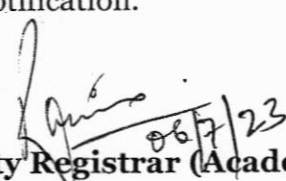
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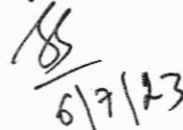
No. F. Acd/II/23/6012-6051

Dated: 6-7-2023.

Copy for information and necessary action to:

- 1 Dean, Faculty of Science
- 2 Convener, Board of Studies in **Chemistry**
- 3 Sr. P.A. to the Controller of Examinations
- 4 All members of the Board of Studies
- 5 Confidential Assistant to the Controller of Examinations
- 6 I/C Director, Computer Centre, University of Jammu
- 7 Deputy Registrar/Asst. Registrar (Conf. /Exams. UG)
- 8 Incharge, University Website for Uploading of the notification.

  
Deputy Registrar (Academic)

  
6/7/23

  
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Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020

UNIVERSITY OF JAMMU

**SYLLABUS FOR FOUR YEAR UNDERGRADUATE PROGRAMME (FYUGP) IN CHEMISTRY W.E.F. ACADEMIC SESSION 2022 AS PER NATIONAL EDUCATION POLICY (NEP)**

List of Major (MJ), Minor (MI), Skill (SEC) and Multi Disciplinary (MD) Courses for 3<sup>rd</sup> and 4<sup>th</sup> Semesters of Four Year Undergraduate Program (FYUGP) in Chemistry as per National Education Policy (NEP)  
[Semester III-IV]

S. No.	Level (UG/Sem)	Course Code	Credits	Course Name	Nature of open Elective
1.	UG/Sem-3	UMJCHT-301	4 (3 credit theory + 1 credit practical)	Foundation Course Chemistry-3	MJ
2.	UG/Sem-3	UMJCHT-302	4 (3 credit theory + 1 credit practical)	Analytical Chemistry	MJ
3.	UG/Sem-3	UMICHT-303	4 (3 credit theory + 1 credit practical)	Foundation Course Chemistry-3	MI
4.	UG/Sem-3	UMDCHT-304	3	Chemistry in Everyday Life	MD
5.	UG/Sem-3	USECHT-305	2 (1 credit theory + 1 credit practical)	Chemistry of Food & Cosmetics	SEC
6.	UG/Sem-4	UMJCHT-401	4 (3 credit theory + 1 credit practical)	Physical Chemistry-1	MJ
7.	UG/Sem-4	UMJCHT-402	4 (3 credit theory + 1 credit practical)	Organic Chemistry-1	MJ
8.	UG/Sem-4	UMJCHT-403	4 (3 credit theory + 1 credit practical)	Inorganic Chemistry-1	MJ
9.	UG/Sem-4	UMJCHT-404	4 (3 credit theory + 1 credit practical)	Spectroscopic and Nuclear Chemistry	MJ
10.	UG/Sem-4	UMICHT-405	4 (3 credit theory + 1 credit practical)	Inorganic Chemistry-1	MI

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMJCHT-301 (Major course)**

**Title: FOUNDATION COURSE CHEMISTRY-3**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

**Theory: 03 Credits**

**Duration of Course: 45 hours**

**UNIT-I: Chemistry of saturated and unsaturated Aliphatic Hydrocarbons**

**(13 Lectures)**

**a) Chemistry of Alkanes :** Formation of alkanes by Wurtz Reaction, Wurtz Fitting Reaction, Free Radical Substitution in alkanes, Halogenation : Relative reactivity and selectivity.

**b) Chemistry of Alkenes and Alkynes :**

**Formation of Alkenes** by E1, E2, E1cB reactions, Hoffmann Elimination and Saytzeff rule. Addition of Halogen to alkenes : Carbocation and Halonium ion Mechanism. Ozonolysis of Propene with Mechanism. Addition of Hydrogen halides to alkenes with mechanism, Markownikoff's rule Addition of HBr to Propene ( Peroxide Effect/Anti-Markownikoff addition), Syn and Anti Addition Hydrogenation, Hydroxylation, Hydration, reaction with NBS

**Alkynes:** Acidity of Alkynes, Alkylation of terminal Alkynes, hydrogenation and hydration of Alkynes

Relative Reactivity of Alkenes and Alkynes

**c) Butadiene:** 1,2 and 1,4 addition reaction of butadiene

**d) Cycloalkanes ( upto Cyclohexane) :** Nomenclature, Methods of Preparation. Stability of Cycloalkanes : Bayer Strain Theory

**UNIT-II: Aromatic hydrocarbons**

**(10 Lectures)**

**Concept of Aromaticity:** Benzenoids and Hückel's rule, **Structure of Benzene:** Kekule Structures, Resonance and Molecular Orbital Theory

**Preparation (Case Benzene):** from Phenol, , from Acetylene, from Benzene sulphonic acid, by decarboxylation

**Reactions: (Case Benzene):** General mechanism of Electrophilic Substitution reactions,  $\sigma$  and  $\pi$  complexes, Nitration, Halogenation and Sulphonation.

**Friedel-Craft's reaction : alkylation** (upto 3 carbons on benzene) and **acylation**

**Side chain oxidation of alkyl benzenes** (upto 3 carbons on benzene).

Activating and Deactivating groups, Orientation effect, Ortho-para ratio

Aromatic nucleophilic Substitution ( $S_NAr$ ) with mechanism.

**UNIT-III : Thermodynamics-I**

**(11 Lectures)**

Definition of thermodynamics terms: system, surroundings, boundary. Types of system, Thermodynamic variables, intensive and extensive properties. State and path functions. Thermodynamic equilibrium. Thermodynamic process. Concept of heat and work.

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMJCHT-301 (Major course)**

**Title: FOUNDATION COURSE CHEMISTRY-3**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

First Law of Thermodynamics: Statement and our daily life examples, internal energy and its physical significance. Heat change at constant volume, heat change at constant pressure: Enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Variation of internal energy with temperature and volume, Joules law. Variation of enthalpy with temperature and pressure, Joule-Thomson coefficient and inversion temperature.

**UNIT-IV Chemistry of s and p Block Elements-I**

**(11 Lectures)**

Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group. Allotropy and catenation. Complex formation tendency of s and p block elements. Hydrides and their classification ionic, covalent and interstitial. Preparation, structure and bonding of borohydrides (diborane).

**BOOKS RECOMMENDED:**

1. Morrison, R.N., Boyd, R.N., Bhattacharjee, S.k. (2010) Organic Chemistry.
2. Finar, I.L. (2002) Organic Chemistry Volume I, II, 6<sup>th</sup> Edition Pearson Education.
3. McMurry, J.E. Fundamentals of Organic Chemistry, 7<sup>th</sup> Ed. Cengage Learning India Edition, 2013.
4. Sykes, P.A. Guidebook to Mechanism in Organic Chemistry, Orient Longman, Longman, new Dehli (1988).
5. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
6. R.P.Rastogi, R.R.Misra. Sixth Revised Edition. Vikas Publishing House Pvt. Ltd.
7. Bell, R. P., Proton in Chemistry, 2nd Ed., Chapman Hall, (1973).
8. Drago, R. S., Modern Approach to Acid base Chemistry, J. C.Chem. Educ., 51, 300 (1974).
9. Gillespie, R. R., Proton acids, Lewis acids, hard acids, soft acids and super acids. Chapman and Hall (1975).
10. Jensen, W.B., The Lewis Acid-Base Concepts, Wiley, New York (1980).
11. Nicholls, D. Inorganic Chemistry in Liquid Ammonia, Elsevier (1979).
12. Pearson, R. G., Ed., Hard and Soft Acids and Bases, Dowden, Hutchinson (1973).

**Practical: 01 Credit**

**Duration : 30 Hours**

**Section A : Organic Chemistry :**

Qualitative analysis of following Organic Compounds :

1. Naphthalene
2. Anthracene

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMJCHT-301 (Major course)**

**Title: FOUNDATION COURSE CHEMISTRY-3**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

3. Benzoic Acid
4. Salicylic Acid
5. Glucose
6. Sucrose
7. Catechol
8. Resorcinol
9. Salicylaldehyde
10. Acetophenone
11. Benzophenone
12. P-aminobenzoic
13. Urea
14. Thiourea
14. Acetamide
15. Benzamide

(Note : Any 07 to 09 Compounds to be analysed in a semester)

**Section B : Physical Chemistry :**

1. Determination of heat capacity of calorimeter.
2. Determination of heat of neutralization hydrochloric acid with sodium hydroxide.

**Section C: Inorganic Chemistry:**

Semi-micro qualitative analysis using  $H_2S$  of mixtures of salts (not more than four ionic species, two anions and two cations and excluding insoluble salts) out of the following:

Cations :  $NH_4^+$ ,  $Pb^{2+}$ ,  $Ag^+$ ,  $Bi^{3+}$ ,  $Cu^{2+}$ ,  $Cd^{2+}$ ,  $Sn^{2+}$ ,  $Fe^{3+}$ ,  $Al^{3+}$ ,  $Co^{2+}$ ,  $Cr^{3+}$ ,  $Ni^{2+}$ ,  $Mn^{2+}$ ,  $Zn^{2+}$ ,  $Ba^{2+}$ ,  $Sr^{2+}$ ,  $Ca^{2+}$ ,  $K^+$

Anions :  $CO_3^{2-}$ ,  $S^{2-}$ ,  $SO_3^{2-}$ ,  $NO_3^-$ ,  $CH_3COO^-$ ,  $Cl^-$ ,  $Br^-$ ,  $I^-$ ,  $NO_2^-$ ,  $SO_4^{2-}$ ,  $PO_4^{3-}$ ,  $BO_3^{3-}$ ,  $C_2O_4^{2-}$ ,  $F^-$  (Students should be encouraged to perform Spot tests wherever feasible)

**NOTE FOR PAPER SETTING:**

**Total marks = 75**

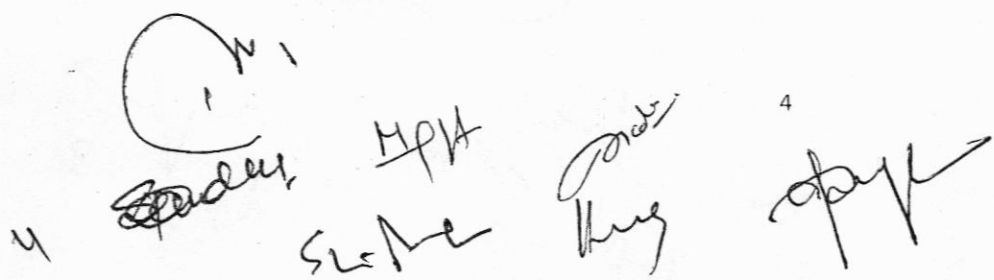
The evaluation of course shall contain two parts:

**Mid semester assessment:** The internal assessment shall be held on completion of about 50% of the prescribed syllabus. The question paper shall comprise of four questions of five marks each. The candidate has to attempt any three of them. (Total Marks: 15; Time Duration: 1½ hour)

**End semester assessment:** It consists of two sections:

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMJCHT-301 (Major course)**

**Title: FOUNDATION COURSE CHEMISTRY-3**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

**Section A** will consist of four short answer questions (one question from each unit) of 3 marks each covering the entire syllabi. **Section B** consists of eight long answer questions (two questions from each unit) of 12 marks each. Section A is compulsory. From Section B, the candidate has to attempt four questions in total, selecting one from each unit. (**Total Marks: 60; Time Duration: 3 hours**)

**EVALUATION OF PRACTICALS:**

Daily evaluation of practical records/viva-voce etc.	10 marks	
Final examination	100 % Syllabus	15 marks (10 marks = practical assessment + 5 marks= viva-voce examination)

**BOOKS RECOMMENDED:**

1. Vogel's Textbook of Practical Organic Chemistry, Brian S. Furniss, Antony J. Hannaford, Peter W. G. Smith, Austin R. Tatchell. Pearson 5th Edition, 2012.
2. Man, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson education (2009).
3. Practical Physical Chemistry; Khosla, B. D.; Garg, V. C. & Gulati, A.; R. Chand & Co.; 2011.
4. Experiments in Physical Chemistry; Das, R. C, and Behra, B.; Tata McGraw Hill.
5. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
6. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMJCHT-302 (Major course)**

**Title: ANALYTICAL CHEMISTRY**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

**Theory: 03 Credits**

**Duration of Course: 45 hours**

**UNIT-I: Basics of Analytical chemistry**

**(12 Lectures)**

Classification of analytical techniques. Choice of analytical method chosen: accuracy, precision, sensitivity, selectivity and method validation. Limit of detection (LOD), Limit of quantification (LOQ), Limitations of analytical methods – Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors.

Basic laboratory practices: calibration of glassware (pipette, burette and volumetric flask), Sampling (solids and liquids), weighing, drying, dissolving, Acid treatment, Safety in Chemical

Laboratory, Rules of fire prevention and accidents. First aid, Precautions to be taken while handling toxic chemicals, concentrated/fuming acids and organic solvents.

**UNIT-II: Acid-base and complexometric Titrimetry**

**(11 Lectures)**

Basic principle and Classification of titrimetric analysis.

**Acid-base titrimetry:** Titration curves for strong acid vs strong base, weak acid vs strong base and weak base vs strong acid titrations. Titration curves, Quantitative applications – selecting and standardizing a titrant, inorganic analysis - alkalinity, acidity.

**Complexometric titrimetry:** Indicators for EDTA titrations- theory of metal ion indicators, titration methods employing EDTA - direct, back, displacement and indirect determinations, Application-determination of hardness of water.

**UNIT-III: Redox and Precipitation Titrimetry and Gravimetric Analysis**

**(11 Lectures)**

**Redox titrimetry:** Balancing redox equations, calculation of the equilibrium constant of redox reactions, titration curves, Theory of redox indicators, calculation of standard potentials using Nernst equation. Applications.

**Precipitation titrimetry:** Titration curves, titrants and standards, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.

**Gravimetric Analysis:** Principle and mechanism of precipitation, Factors influencing precipitation, Co-precipitation, post-precipitation, Advantages of organic reagents over inorganic reagents, Importance of reagents used in gravimetry [8-hydroxyquinoline (oxine) and dimethyl glyoxime (DMG)].

**UNIT-IV: Chromatographic Methods**

**(11 Lectures)**

Classification of chromatographic methods: Principles of differential migration, description of Chromatographic process, distribution coefficients, capacity factor, column efficiency and resolution, Techniques of sample preparation in chromatography.

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMJCHT-302 (Major course)**

**Title: ANALYTICAL CHEMISTRY**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

Brief overview of paper chromatography (detections of spots, retardation factors, factors that affect reproducibility of  $R_f$  values) and Thin Layer Chromatography (Stationary phase, adsorbents, liquid phase support, plate preparation, mobile phase, sample application, development, detection of spot,  $R_f$  values).

**Practical: 01 Credit**

**Duration : 30 Hours**

1. Separation of ortho- & para-nitrophenol and o- and p-aminophenol by thin layer chromatography (TLC) and calculation of their  $R_f$  values.
2. Separation of divalent 3d transition metal ions by paper chromatography.
3. Determination of carbonate and bicarbonate present in water sample.
4. Preparation of EDTA solution and estimation of hardness ( $\text{CaCO}_3$ ) of two different samples.
5. Preparation of standard  $\text{Na}_2\text{CO}_3$  solution, standardization of given HCl solution and estimation of alkali present in given antacid.
6. Determination of chlorine in two different samples of bleaching powder by iodometry (standard sodium thiosulphate solution to be supplied)
7. Estimation of Cu(II) using sodium thiosulphate solution (Iodometrically).
8. Estimation of  $\text{K}_2\text{Cr}_2\text{O}_7$  using sodium thiosulphate solution (Iodometrically).

**NOTE FOR PAPER SETTING:**

**Total marks = 75**

The evaluation of course shall contain two parts:

**Mid semester assessment:** The internal assessment shall be held on completion of about 50% of the prescribed syllabus. The question paper shall comprise of four questions of five marks each. The candidate has to attempt any three of them. **(Total Marks: 15; Time Duration: 1½ hour)**

**End semester assessment:** It consists of two sections:

**Section A** will consist of four short answer questions (one question from each unit) of 3 marks each covering the entire syllabi. **Section B** consists of eight long answer questions (two questions from each unit) of 12 marks each.

Section A is compulsory. From Section B, the candidate has to attempt four questions in total, selecting one from each unit. **(Total Marks: 60; Time Duration: 3 hours)**

**EVALUATION OF PRACTICALS:**

Daily evaluation of practical records/viva-voce etc.	10 marks
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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMJCHT-302 (Major course)**

**Title: ANALYTICAL CHEMISTRY**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

Final examination	100 % Syllabus	15 marks (10 marks = practical assessment + 5 marks= viva-voce examination)
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**BOOKS RECOMMENDED:**

1. Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
2. Willard, H. H., Merritt, L.L., Dean, J. & Settle, F.A. Instrumental Methods of Analysis, Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. Christian, G.D; Analytical Chemistry, VI Ed. John Wiley & Sons, New York, 2004.
4. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
5. Skoog, D. A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed, 2017.
6. Ditts, R.V. Analytical Chemistry; Methods of Separation, van Nostrand, 1974.
7. Fifield, F.W.; Kealey, D. (2000), Principles and Practice of Analytical Chemistry, Wiley.
8. Harris, D. C. (2007), Exploring Chemical Analysis, W.H. Freeman and Co.
9. Harris, D. C. (2007), Quantitative Chemical Analysis, 6th Edition, Freeman.
10. Mikes. O. (2000), Laboratory Handbook of Chromatographic methods, D.Van Nostrand Company Inc.

*Handwritten notes and signatures:*  
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The name 'S. Me' followed by 'M.P.H.'  
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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMICHT-303 (Minor course)**

**Title: FOUNDATION COURSE CHEMISTRY-3**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

**Theory: 03 Credits**

**Duration of Course: 45 hours**

**UNIT-I : Chemistry of saturated and unsaturated Aliphatic Hydrocarbons (13 Lectures)**

**a) Chemistry of Alkanes :** Formation of alkanes by Wurtz Reaction, Wurtz Fitting Reaction, Free Radical Substitution in alkanes, Halogenation : Relative reactivity and selectivity.

**b) Chemistry of Alkenes and Alkynes:**

**Formation of Alkenes** by E1, E2, E1cB reactions, Hoffmann Elimination and Saytzeff rule. Addition of Halogen to alkenes : Carbocation and Halonium ion Mechanism. Ozonolysis of Propene with Mechanism. Addition of Hydrogen halides to alkenes with mechanism, Markownikoff's rule Addition of HBr to Propene ( Peroxide Effect/Anti-Markownikoff addition), Syn and Anti Addition Hydrogenation, Hydroxylation, Hydration.

**Alkynes :** Acidity of Alkynes, Alkylation of terminal Alkynes, hydrogenation and hydration of Alkynes

**Relative Reactivity of Alkenes and Alkynes**

**c) Cycloalkanes ( upto Cyclohexane) :** Nomenclature and Methods of Preparation.

**UNIT-II : Aromatic hydrocarbons (10 Lectures)**

**Concept of Aromaticity:** Benzenoids and Hückel's rule, **Structure of Benzene:** Kekule Structures, Structure of Benzene on the basis of Resonance and Molecular Orbital Theory. Concept of resonance energy.

**Preparation (Benzene):** from Phenol, from Acetylene, from Benzene sulphonic acid, by decarboxylation

**Reactions: (Benzene):** General mechanism of Electrophilic Substitution reactions, Nitration, Halogenation and Sulphonation.

**Friedel-Craft's reaction : alkylation** (upto 3 carbons on benzene) and acylation  
Activating and deactivating groups, Orientation effect, ortho-para ratio.

**UNIT-III: Thermodynamics-I (11 Lectures)**

Definition of thermodynamics terms: system, surroundings, boundary. Types of system, Thermodynamic variables, intensive and extensive properties. State and path functions. Thermodynamic equilibrium. Thermodynamic process. Concept of heat and work.  
**First Law of Thermodynamics:** Statement and our daily life examples, internal energy and its physical significance. Heat change at constant volume, heat change at constant pressure: Enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Variation of internal energy with temperature and volume. Variation of enthalpy with temperature and pressure. Entropy and its significance. 2<sup>nd</sup> Law of thermodynamics.

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMICHT-303 (Minor course)**

**Title: FOUNDATION COURSE CHEMISTRY-3**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

**UNIT-IV Chemistry of s and p Block Elements – I**

**(11 Lectures)**

Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group. Allotropy and catenation. Complex formation tendency of s and p block elements. Hydrides and their classification ionic, covalent and interstitial. Preparation, structure and bonding of borohydrides (diborane).

**BOOKS RECOMMENDED:**

1. Morrison, R.N., Boyd, R.N., Bhattacharjee, S.k. (2010) Organic Chemistry.
2. Finar, I.L. (2002) Organic Chemistry Volume I, II, 6<sup>th</sup> Edition Pearson Education.
3. McMurry, J.E. Fundamentals of Organic Chemistry, 7<sup>th</sup> Ed. Cengage Learning India Edition, 2013.
4. Sykes, P.A. Guidebook to Mechanism in Organic Chemistry, Orient Longman, Longman, new Dehli (1988).
5. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
6. R.P.Rastogi, R.R.Misra. Sixth Revised Edition. Vikas Publishing House Pvt. Ltd.
7. Bell, R. P., Proton in Chemistry, 2nd Ed., Chapman Hall, (1973).
8. Drago, R. S., Modern Approach to Acid base Chemistry, J. C.Chem. Educ., 51, 300 (1974).
9. Gillespie, R. R., Proton acids, Lewis acids, hard acids, soft acids and super acids. Chapman and Hall (1975).
10. Jensen, W.B., The Lewis Acid-Base Concepts, Wiley, New York (1980).
11. Nicholls, D. Inorganic Chemistry in Liquid Ammonia. Elsevier (1979).
12. Pearson, R. G., Ed., Hard and Soft Acids and Bases, Dowden, Hutchinson (1973).

**Practical: 01 Credit**

**Duration : 30 Hours**

**Section A : Organic Chemistry :**

Qualitative analysis of following Organic Compounds :

1. Naphthalene
2. Anthracene
3. Benzoic Acid
4. Oxalic Acid
5. Salicylic Acid
6. Sucrose
7. Catechol
8. Resorcinol
9. Salicylaldehyde

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Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

Course No.: UMICHT-303 (Minor course)

Title: FOUNDATION COURSE CHEMISTRY-3

Credits: 03 (Theory) + 01 (Practical)

Maximum Marks: 100 [75 (Theory) + 25 (Practical)]

Duration of Examination: 3 hours

10. Acetophenone
11. Benzophenone
12. P-aminobenzoic acid
13. p-chlorobenzoic acid
14. Thiourea
15. Acetamide
16. Benzamide

(Note : Any 07 to 09 Compounds to be analysed in a semester)

**Section B : Physical Chemistry :**

1. Determination of heat capacity of calorimeter.
2. Determination of heat of neutralization hydrochloric acid with sodium hydroxide.
3. Determination of heat of neutralization acetic acid with sodium hydroxide.

**Section C: Inorganic Chemistry :**

Semi-micro qualitative analysis using  $H_2S$  of mixtures of salts (not more than four ionic species, two anions and two cations and excluding insoluble salts) out of the following:

Cations :  $NH_4^+$ ,  $Pb^{2+}$ ,  $Ag^+$ ,  $Bi^{3+}$ ,  $Cu^{2+}$ ,  $Cd^{2+}$ ,  $Sn^{2+}$ ,  $Fe^{3+}$ ,  $Al^{3+}$ ,  $Co^{2+}$ ,  $Cr^{3+}$ ,  $Ni^{2+}$ ,  $Mn^{2+}$ ,  $Zn^{2+}$ ,  $Ba^{2+}$ ,  $Sr^{2+}$ ,  $Ca^{2+}$ ,  $K^+$

Anions :  $CO_3^{2-}$ ,  $S^{2-}$ ,  $SO_3^{2-}$ ,  $S_2O_3^{2-}$ ,  $NO_3^-$ ,  $CH_3COO^-$ ,  $Cl^-$ ,  $Br^-$ ,  $I^-$ ,  $NO_2^-$ ,  $SO_4^{2-}$ ,  $PO_4^{3-}$ ,  $BO_3^{3-}$ ,  $C_2O_4^{2-}$ ,  $F^-$  (Students should be encouraged to perform Spot tests wherever feasible)

**NOTE FOR PAPER SETTING:**

Total marks = 75

The evaluation of course shall contain two parts:

**Mid semester assessment:** The internal assessment shall be held on completion of about 50% of the prescribed syllabus. The question paper shall comprise of four questions of five marks each. The candidate has to attempt any three of them. (Total Marks: 15; Time Duration: 1½ hour)

**End semester assessment:** It consists of two sections:

**Section A** will consist of four short answer questions (one question from each unit) of 3 marks each covering the entire syllabi. **Section B** consists of eight long answer questions (two questions from each unit) of 12 marks each.

Section A is compulsory. From Section B, the candidate has to attempt four questions in total, selecting one from each unit. (Total Marks: 60; Time Duration: 3 hours)

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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMICHT-303 (Minor course)**

**Title: FOUNDATION COURSE CHEMISTRY-3**

**Credits: 03 (Theory) + 01 (Practical)**

**Maximum Marks: 100 [75 (Theory) + 25 (Practical)]**

**Duration of Examination: 3 hours**

**EVALUATION OF PRACTICALS:**

Daily evaluation of practical records/viva-voce etc.	10 marks	
Final examination	100 % Syllabus	15 marks (10 marks = practical assessment + 5 marks = viva-voce examination)

**BOOKS RECOMMENDED:**

1. Vogel's Textbook of Practical Organic Chemistry, Brian S. Furniss, Antony J. Hannaford, Peter W. G. Smith, Austin R. Tatchell. Pearson 5th Edition, 2012.
2. Man, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson education (2009).
3. Practical Physical Chemistry; Khosla, B. D.; Garg, V. C. & Gulati, A.; R. Chand & Co.; 2011.
4. Experiments in Physical Chemistry; Das, R. C. and Behra, B.: Tata McGraw Hill.
5. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
6. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

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guy*

**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

(For examinations to be held in the years Dec. 2023, 2024 & 2025)

**Semester-III**

**Course No.: UMDCHT-304 (Multi Disciplinary Course)**

**Title: CHEMISTRY IN EVERYDAY LIFE**

**Credits: 03 (Theory)**

**Maximum Marks: 75 (Theory)**

**Duration of Examination: 3 hours**

**Theory: 03 Credits**

**Duration of Course: 45 hours**

**Learning Objectives:**

To learn about food additives and chemical composition of drugs.

**UNIT-I Chemotherapy**

**(13 Lectures)**

Definition of chemotherapy- examples each for (i) Analgesics, (ii) antibacterial, (iii) anti-inflammatory, (iv) antipyretic, (v) antibiotic, (vi) antacid (vii) antiviral, (viii) antidepressant, (ix) antiallergic, (x) antidiabetics, (xi) antihypertensive, (xii) anaesthetics (local and general)

**Structures not necessary.**

**UNIT-II Food Additives and Preservation**

**(12 Lectures)**

Artificial sweeteners - saccharin - cyclamate and aspartate, food flavours esters and aldehydes. Food colours - restricted use of spurious colors - emulsifying agents - leavening agents, baking powder, yeast - taste makers - MSG, vinegar. Food preservation - Methods - preservation by low temperature, high temperature - preservatives.

**Structures not necessary.**

**UNIT-III Biomolecules-I**

**(10 Lectures)**

**Carbohydrates:** Definition, classification and their importance

**Amino acids:** Essential and non-essential. Definition, classification and their importance.

**Oils and Fats:** Definition, classification and importance. Saponification value

**Structure not necessary.**

**UNIT- IV Biomolecules-II**

**(10 Lectures)**

**Vitamins:** Nomenclature and Classification, Sources, deficiency diseases due to vitamins A, B, C, D, E and K. Structure not necessary.

**Minerals:** Macro and micro elements, importance and deficiency diseases.

**Structure not necessary.**

**NOTE FOR PAPER SETTING:**

**Total marks = 75**

The evaluation of course shall contain two parts:

**Mid semester assessment:** The internal assessment shall be held on completion of about 50% of the prescribed syllabus. The question paper shall comprise of four questions of five marks

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S. K. Singh  
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**Syllabus and courses of studies in the subject of Chemistry under CBCS as per NEP-2020**

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**BOOKS RECOMMENDED:**

1. Thangamma Jacob, Textbook of Applied chemistry for home science and Allied Science, New Delhi, Macmillan Co., (1979).
2. Macmillan, 1st Ed., 1990. M. Swaminathan, Text Book on Food chemistry, Printing and Publishing Co., Ltd., Bangalore, 1993.
3. Alex Ramani, V., Food Chemistry, MJP Publishers, Triplicane, Chennai, 2009. 9. Sivasankar, B., Food Processing and Preservation, PHI Learning Private Limited, Delhi, 2013.
4. B. S. Bahl, A. Bhal, —Textbook of Organic chemistry, S. Chand and Company Ltd., New Delhi, 22nd Ed., 2016.
5. Organic Chemistry of Natural Products-Volume I and II by Gurdeep R Chatwal, Himalaya Publishing House.

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