

Ch. Bansi Lal University, Prem Nagar
(A State University established under Haryana Act No. 23 of 2014)



**Scheme of Examination
for
Chemistry Subject
in
Under Graduate Programmes**

as per NEP 2020

Curriculum and Credit Framework for Undergraduate Programmes
(Multiple Entry-Exit, Internships and Choice based credit system LOCF)

With the effect from the session 2024-25 (in phased manner)

DEPARTMENT OF CHEMISTRY

Ch. Bansi Lal University, Prem Nagar-127031

Bhiwani

HARYANA, INDIA

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MD, [Signature], [Signature], Ravi Kant

Chaudhary Bansi Lal University, Bhiwani

(A State University established under Haryana Act No. 25 of 2014)



**Examination Scheme and Syllabus
For
Undergraduate Programme
In
Chemistry Subject**

as per NEP 2020

**Curriculum and Credit Framework for Postgraduate Programmes
(Multiple Entry-Exit, Internship and Choice Based Credit System LOCF)**

With effect from the Session 2024-25 (in phased manner)

**DEPARTMENT OF CHEMISTRY
FACULTY OF PHYSICAL SCIENCES
Chaudhary Bansi Lal University, Prem Nagar– 127031
BHIWANI
HARYANA, INDIA**

Scheme A- It is applicable to Undergraduate programmes (Multidisciplinary) of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

Scheme B- it is applicable to Undergraduate Programmes with Single Major after first year of UG Programme (Multidisciplinary) of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

Scheme C- It is applicable to Undergraduate Programmes with Single Major of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

Scheme D- It is applicable to Undergraduate Programmes (Interdisciplinary) of Chaudhary Bansi Lal University, Bhiwani under NEP-2020 w.e.f. the Academic Session 2024-25.

1. Key Terms

1.1 Academic Year and Semester: Two consecutive (one odd and one even) semesters will constitute one academic year. A semester will consist of 90 days of academic work.

1.2 Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week over the duration of one semester. For calculation of the teaching hours, one credit means one hour of lecture or one hour of tutorial or one hour of seminar or two hours of practicum/laboratory work per week over the duration of a semester.

1.3 Learning Outcome based Curriculum Framework (LOCF): The learning outcomes of the programme are mapped against well-defined Course Learning Outcomes (CLOs).

1.4 Choice Based Credit System (CBCS): The CBCS provides choices to students to select disciplinary and interdisciplinary courses to fit into their own requirements and to learn at their own pace within the framework.

1.5 Programme: A programme is made up of courses and leads to the award of a Certificate, Diploma or Degree after completing requisite courses successfully.

1.6 Course: A course refers to component of a programme. A course may comprise of lectures/tutorials/practicum or laboratory work/field practice/project work/seminar/community engagement and service/internship/dissertation, etc. or any combination of these.

1.6.1 Lecture: Component of a course which is taught by a teacher through lectures covering the contents of a course.

1.6.2 Tutorial: Component of a course which involves problem-solving, learning through discussions and remedial teaching related to the contents and periphery of a course with the direct involvement of a teacher.

1.6.3 Practicum: A course or a component of a course which enables students to learn or to attain skills or to get procedural knowledge for the contents of a course through practical/laboratory activity/project and to apply learnt/studied principles/theory/concepts related to the chosen field of learning, work/vocation, or professional practice in the field of learning, work/vocation under the supervision of a teacher.

1.6.4 Seminar: A course or a component of a course which makes students to learn a specific

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topic through in-depth exploration and analysis of facts about the topic in a set-up that involves presentation, interactive discussions and collaborative learning under the supervision of a teacher.

1.6.5 Internship: A course requiring students to participate in professional employment-related activity or work experience or co-operative education activity with an entity external to the educational institution normally under the supervision of an employee of an organization or an individual professional. A key aspect of the internship is induction into actual, formal and organized work situations. Internship involves working with local industry (Government or Private organizations), business establishments, artists, craft persons, etc. to provide opportunities for students to actively engage in on-site experiential learning.

1.6.6 Studio Activity: A studio activity involves engagement of students in creative, artistic or experimental activities involving visual, digital, audio, video and other professional experiential work.

1.6.7 Field Work/Practice/Survey/Project: A course or a component of course which enables students to participate in field-based learning/project, involving application of knowledge in solving/analyzing/exploring a real-life situation/difficult problem under the supervision of a teacher/mentor.

1.6.8 Project Work: A course or a component of a course which facilitates students to apply their knowledge, skills and critical thinking ability to complete a specific task in a given time frame through conceptualization, exploration and analysis of research-based activities to suggest tangible solutions for a given problem related to the chosen field of learning.

1.6.9 Community Engagement and Service: A course or a component of a course which exposes the students to the socio-economic issues prevailing in society so that the theoretical learning can be supplemented by actual life experiences to understand and generate solutions to real-life problems.

1.7 Major and Minor Subject: Major subject is a subject of choice in a discipline which equips a student with knowledge, understanding and skills majorly in the chosen field of learning contributing to the core of the programme.

Minor subject helps a student to gain a broader understanding in addition to the Major subject. The courses in Major subjects will be Core Courses (CC), while a Minor subject will include CC as well as Vocational Courses (VOC).

1.7.1 Core Course (CC): A compulsory course of a subject aimed to cover the basics of Major/Minor subject.

1.7.2 Vocational Courses (VOC): A vocational course is focused on practical work, preparing students for a particular skilled profession. Such courses develop capacities for sustenance, work, and economic participation and develop values and sensibilities toward physical work.

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Semester-IV

Course Type Total Credits	Applicable Scheme	Course Code	Nomenclature of the Course	Credits	Contact hours per week	Internal Assessment Marks	End term Examination Marks	Total Marks	Examination Hrs.
CC-4 MCC-6 04 Credits	Scheme A, B, C & D	24UN-CHE-401	Chemistry – IV	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
			Organic Chemistry – I	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
MCC-7 04 Credits	Scheme B & C	24UN-CHE-402	Physical Chemistry - II	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
			Elective Chemistry- I	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
MCC-8 04 Credits	Scheme B & C	24UN-CHE-403	Physical Chemistry - II	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
			Elective Chemistry- I	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
DSE-1 04 Credits Select one option	Scheme B & C	24UN-CHE-404	OR						
			Elective Chemistry- II	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
			OR						
		24UN-CHE-405	Elective Chemistry- III	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
			OR						
			Elective Chemistry- III	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
		24UN-CHE-406	OR						
			Elective Chemistry- III	03	03	20	50	70	03
			Practical	01	02	10	20	30	03
CC-M4 (V) 04 Credits	Scheme A, B, C & D	From Available pool of Minor (Vocational) Courses VOC-2							
A-4 02 Credits	Scheme A, B & C	From Available pool of Ability Enhancement Courses as per NEP							
VAC-3 02 Credits	Scheme A, B & D	From Available pool of Value Added Courses as per NEP							
VAC-4 02 Credits	Scheme C only	From Available pool of Value Added Courses as per NEP							
Internship 04 Credits	Scheme A, B & C	Internship of 04 Credits of 4-6 weeks duration after 4 th Semester (If not done after 2 nd Semester)							



 Dr. Ravi Kant

CC-4/MCC-6

Session: 2024-25			
Part A - Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Chemistry-IV		
Course Code	22UN-CHE-401		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC/MCC		
Level of the course (As per Annexure-I)	200-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Classify d block and f block elements and also know their properties 2. Learn about the basic idea of analysis with respect to qualitative as well as quantitative measures 3. Know about the first and second law of thermodynamics and also their implications and also know about the concept of chemical equilibrium 4. Know about the alcohols, phenols, aldehydes and ketones with respect to their general characteristics and their important reactions 5*. To get knowledge about identification and confirmation of acidic and basic radicals in a given inorganic salts/mixtures		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75

Max. Marks:70+30* Internal Assessment Marks:20+10* End Term Exam Marks: 50+20*		Time:03+03*
Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.		
Unit	Topics	Contact Hours
I	Chemistry of d-Block elements Definition of transition elements, General characteristic properties of d-Block elements, Comparison of ionic radii 3d, 4d and 5d series elements, magnetic properties, Stability of various oxidation states and Latimer and Frost diagrams, Structure of some compounds of transition elements- TiO_2, VOCl_2, FeCl_3, CuCl_2 and $\text{Ni}(\text{CO})_4$. Chemistry of f-Block elements Lanthanide contraction, oxidation states, magnetic properties, complex formation, colour and ionic radii. Actinides: General characteristics of actinides, Transuranic elements, comparison of properties of Lanthanides and actinides with transition elements.	12
II	Thermodynamics-I First law of thermodynamics: statement, concepts of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule– Thomson coefficient for ideal gas and real gas and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Second law of thermodynamics Carnot cycles and its efficiency, Concept of entropy, entropy as a function of V & T, entropy as a function of P & T Chemical Equilibrium Concept of Equilibrium constant, Temperature dependence of equilibrium constant, Clausius–Clapeyron equation and its applications.	11

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III	Alcohols Monohyric alcohols: nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids, and esters. Hydrogen bonding, Acidic nature, Reactions of alcohols. Phenols Nomenclature, structure, and bonding. Preparation: Cumene hydroperoxide method, from diazonium salts, physical properties, and acidic character. Chemical Reactions: — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction	11
IV	Aldehydes and Ketones Nomenclature and structure of the carbonyl group. Preparation: oxidation of alcohols, from acid chlorides and from nitriles, Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group: benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen and Wolff-Kishner reductions.	11
V*	Practicals: 1. To prepare salicylic acid from Aspirin. 2. To prepare m-nitroaniline from m-dinitrobenzene. 3. Semimicro qualitative analysis of mixture containing not more than four radicals (excluding interfering, Combinations and insoluble): Pb^{2+} , Cu^{2+} , Fe^{3+} , Ni^{2+} , Ca^{2+} , NH_4^+ , CO_3^{2-} , NO_3^- , CH_3COO^- , Cl^- , Br^- , I^- , PO_4^{3-} , SO_4^{2-}	30

MCC-8

Session: 2024-25			
Part A - Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Physical Chemistry-II		
Course Code	24UN-CHE-403		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C)	MCC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	Chemistry as a subject at 4.0 Level (Class-XII)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Know the concept of phase rule and equilibria with reference to two component system 2. Learn about the Binary solutions and also some theoretical aspects related with this concept 3. Know about the general concept of electrochemistry and also various laws associated with this concept 4. Know about the Concentration cells with and without transference, liquid junction potential and also the basic idea about the surface chemistry 5. To get knowledge about identification and confirmation of basic radicals in a given inorganic salts/mixture		
Credits	Theory	Practical	Total
	03	01	04
Contact Hours/week	03	02	05
Internal Assessment Marks	20	10	30

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End Term Exam Marks	50	20	70
Examination Time	03 Hours	03 Hours	---
Maximum Marks: 100 (Theory :70 & Practical: 30)			

Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.		
Unit	Topics	Contact Hours
I	Statement and meaning of the terms – phase, component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system –Example – water system. Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilverisation of lead.	12
II	Binary solutions: Gibbs-Duhem-Margules equation, its derivation, and applications to fractional distillation of binary miscible liquids (ideal and non-ideal), azeotropes, lever rule, partial miscibility of liquids, CST, miscible pairs, steam distillation. Electrochemical Cells: Rules of oxidation/reduction of ions based on half-cell potentials, Chemical cells, reversible and irreversible cells with examples	11
III	Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half- cells. Application of EMF measurements in determining (i) free energy, enthalpy, and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone.	11

IV	Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and transference numbers. Qualitative	11
	discussion of potentiometric titrations (acid-base, redox). Surface chemistry: Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich).	
Practical		
	Identification and confirmation of basic radicals in a given inorganic mixture via Semimicro qualitative analysis of mixture containing not more than two radicals (excluding interfering, Combinations and insoluble): Pb^{2+} , Cu^{2+} , Fe^{3+} , Ni^{2+} , Ca^{2+} , NH_4^+ , Al^{3+} , Co^{2+} , Zn^{2+} , Mg^{2+} .	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory: 20 • Class Participation: 5 • Seminar/presentation/ assignment/ quiz/ class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum: 10 • Class Participation: NA • Seminar/ Demonstration/ Viva - voce/ Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: ➤ Theory: 50 Written examination ➤ Practicum: 20 Lab record, viva-voce, Demonstration of practical
Part C-Learning Resources		








Recommended Books/e-resources/LMS:

1. Atkins, P.W.; Paula, J.de. (2014), **Atkin's Physical Chemistry Ed.**, 10th Edition, Oxford University Press.
2. Ball, D. W. (2017), **Physical Chemistry**, 2nd Edition, Cengage Learning, India.
3. Castellan, G. W. (2004), **Physical Chemistry**, 4th Edition, Narosa.
4. Kapoor, K.L. (2015), **A Textbook of Physical Chemistry**, Vol 1, 6th Edition, McGraw Hill Education.

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Session: 2024-25			
Part A - Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Elective Chemistry -I		
Course Code	24UN-CHE-404		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C)	DSE		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	Chemistry as a subject at 4.0 Level (Class-XII)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Know the basics of polymers, their classification and uses. 2. Get aware of the different methods to calculate the molecular weight of polymers. 3. Know the Properties of Polymers (Physical, thermal, Flow & Mechanical Properties). 4. Have a detail idea about some specific polymers like polyolefin, polystyrene and styrene copolymers, poly (vinyl chloride) 5. To do the hand on practice in the preparation of polymers and also analysis the role of initiator/binders in the synthesis.		
Credits	Theory	Practical	Total
	03	01	04
Contact Hours/week	03	02	05
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Examination Time	03 Hours	03 Hours	---

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Maximum Marks: 100 (Theory :70 & Practical: 30)

Part B- Contents of the Course

Instructions for Paper- Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non- programmable calculator is allowed.

Unit	Topics	Contact Hours
I	Introduction and history of polymeric materials: History of polymeric materials, Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers Functionality and its importance: Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization Bifunctional systems, Mechanism of copolymerization, polymerization techniques	12
II	Determination of molecular weight of polymers (M_n , M_w , etc.) by end group analysis, viscometry, light scattering, and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index Polymer Solution Criteria for polymer solubility and Solubility parameter.	11
III	Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions. Polymer Degradation Thermal, oxidative, hydrolytic and photodegradation, Properties of Polymers (Physical, thermal, Flow & Mechanical Properties).	11
IV	Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly (vinyl chloride) and related polymers and poly (vinyl acetate), acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite), silicone polymers	11
Practical		

8. Principles of Polymerization by George G. Odian

9. Introduction to Polymer Chemistry by Charles E. Carraher

10. Polymer chemistry by Paul C. Hiemenz

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Odian *Carraher*
Hiemenz

DSE-1

Session: 2024-25

Part A - Introduction

Subject	Chemistry		
Semester	IV		
Name of the Course	Elective Chemistry -II		
Course Code	24UN-CHE-405		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C)	DSE		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	Chemistry as a subject at 4.0 Level (Class-XII)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Learn the basic concept of Acid base theory. 2. Aware about organometallic chemistry and the uses of metal carbonyls. 3. Having an idea of bioinorganic chemistry and role of different ions in the biological system 4. Get aware about properties of silicones and phosphazenes. 5. To get knowledge about the functioning of different metal ions in biological system		
Credits	Theory	Practical	Total
	03	01	04
Contact Hours/week	03	02	05
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Examination Time	03 Hours	03 Hours	---

Max. Marks: 100 (Theory: 70 & Practical: 30)

Part B- Contents of the Course

Instructions for Paper- Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non- programmable calculator is allowed.

Unit	Topics	Contact Hours
I	Acids and Bases Arrhenius, Bronsted-lowry, Lux-flood, solvent system and Lewis concept of acids and bases, relative strength of acids and bases, levelling solvents, hard and soft acids and bases (HSAB), Applications of HSAB principle.	12
II	Organometallic chemistry Definition, classification and nomenclature of organometallic compounds, preparation, properties, and bonding of alkyls of Li, Al, Hg and Sn, concept of hapticity of organic ligand, Structure and bonding in metal- ethylenic complexes, Structure of Ferrocene, classification in metal carbonyls, preparation, properties and bonding in mononuclear carbonyls.	11
III	Bioinorganic chemistry Metal ions present in biological system, classification based on action (essential, non-essential, trace, toxic), Metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of Na^+ , K^+ , Ca^{+2} , Mg^{+2} , Fe^{+2} ions, Cooperative effect, Bohr effect.	11
IV	Silicones and Phosphazenes Nomenclature, classification, preparation and uses of silicones, elastomers, polysiloxane copolymers, poly phosphazenes and bonding in triphosphazene.	11
Practical		
	1. To analyse the various heavy metal ions present in the various natural and biological samples. 2. To identify and quantify the calcium present in the various biological samples 3. Determination of stability constant of a chelate i.e complex between metal ion and ligand.	30

	4. To identify the different types of contrasting agents and their interactions as used in diagnostic procedures.	
Suggested Evaluation Methods		
Internal Assessment: > Theory:20 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 > Practicum:10 • Class Participation: NA • Seminar/ Demonstration/ Viva - voce/ Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: > Theory: 50 Written examination > Practicum: 20 Lab record, viva-voce, Demonstration of practical
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Svehla, G. (1996), Vogel's Qualitative Inorganic analysis, 7th Edition, Prentice Hall. 2. Huheey, J.E.; Keiter, E.A., Keiter, R. L.; Medhi, O.K.(2009), Inorganic Chemistry Principles of Structure and Reactivity, Pearson Education. 3. Shriver, D.D.; Atkins, P.; Langford, C.H. (1994), Inorganic Chemistry 2nd Ed., Oxford University Press. 4. Atkins, P.W.; Overton, T.L.; Rourke, J.P.; Weller, M.T.; Armstrong, F.A. (2010), Shriver and Atkins Inorganic Chemistry, 5th Edition, W. H. Freeman and Company. 5. Cotton, F.A.; Wilkinson, G.; Gaus, P.L. Basic Inorganic Chemistry, 3rd Edition, Wiley India. 6. Greenwood, N.N.; Earnshaw, A.(1997), Chemistry of the Elements, 2nd Edition, Elsevier(Ziegler Natta Catalyst and Equilibria in Grignard solution). 7. Powell, P. (1988), Principles of Organometallic Chemistry, Chapman and Hall.		

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DSE-1

Session: 2024-25

Part A – Introduction

Subject	Chemistry		
Semester	IV		
Name of the Course	Elective Chemistry-III		
Course Code	22UN-CHE-406		
Course Type: (CC/MCC/MD C/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Get the knowledge of drug development; 2. Learn about several types of drugs; 3. Understand about several types of cardiovascular drugs; 4. To know the basics of nutritional chemistry. 5*. To create and analyse drug molecules.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max. Marks: 70+30* Internal Assessment Marks: 20 + 10* End Term Exam Marks: Theory: 50 + 20*		Time: Theory: 03 hrs Practicum: 03 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter			
Note: The examiner is requested to set nine questions in all, selecting two questions from each			

SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Brief history of drug development. Definition, uses and side effects of the following categories of drugs: Antipyretics, analgesics & anti-inflammatory agents (paracetamol, aspirin, ibuprofen and diclofenac); Anti-tussive and expectorant (dextromethorphan, bromhexene); Decongestant (pseudoephedrine, phenylpropanolamine); Anti-allergic (Citrizine, Levocitrizine, diphenhydramine).	12
II	Definition, uses and side effects of the following categories of drugs: Antibacterial drugs (ampicillin, amoxycillin, cephalixin, ciprofloxacin); Antimalarial (Chloroquine, chloroguanide), Anti-amoebic (Metronidazole, tinidazole); Anthelmintic and anti-parasitic (Mebendazole, Albendazole); Anticancer (Chlorambucil, cyclophosphamide), Antihypertensive (amlodipin, atenolol);	11
III	Definition, uses and side effects of the following categories of drugs: Cardiovascular drugs (sorbitrate, diltiazem). Electrolytes (Sodium, Potassium, Chlorides), Renal (Kidney) Function Tests (Creatinine, Blood urea nitrogen), Liver Function Test (Total Protein (Serum), Bilirubin; direct; indirect; total) Cardiac Markers , Minerals (Calcium, magnesium, Phosphate, Potassium), Blood Disorders (Iron, Vitamin B12, Vitamin D, Folic acid) Miscellaneous (Glucose, Glycosylated hemoglobin, Uric acid).	11
IV	Nutritional Chemistry Fat Soluble and water-soluble vitamins (Sources, recommended levels and deficiency diseases; Vitamin A, Vitamin B1, Vitamin B2, Vitamin B3, Vitamin B5, Vitamin B6, Vitamin B7, Vitamin B9, Vitamin B12, Vitamin C, Vitamin D, Vitamin E and Vitamin K). Daily Intake and Roles in Biological processes of following essential dietary minerals Major Minerals- Calcium, Phosphorus, potassium, sodium and magnesium; trace elements- sulfur, Iron, Chlorine, cobalt, Copper, Molybdenum, Iodine and Selenium.	11

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V*	1. Preparation of Aspirin and its analysis. 2. Preparation of Paracetamol and its analysis. 3. Preparation of Ibuprofen and its analysis. 4. Preparation of magnesium bisilicate (Antacid).	30
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		
Internal Assessment: 20+10*=30 > Theory: 20 • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 > Practicum:10 • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: 50+20*
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ✓ Medicinal chemistry; 7th edition, New age international publisher by Ashutosh Kar ✓ Medicinal chemistry; 3rd edition, Handbook of Nutrition and Food, CRC Press by D. Sriram, P. Yogeshwari, Berdanier, Carolyn D., Dwyer, Johanna T., Heber, and David. ✓ The vitamins: fundamental aspects of nutrition and health; Academic press by G. F. Combs Jr. and G.F. combs Sr ✓ Organic Chemistry, Volume-II, Stereochemistry and the chemistry of natural products by IL Finar, 5th edition, Pearson Education India.		

*Applicable for courses having practical component.

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VAC-3

Session: 2024-25			
Part A – Introduction			
Subject	Chemistry		
Semester	III & IV		
Name of the Course	Chemistry in everyday life		
Course Code	24UN-CHE-VAC301		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VAC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Critically think about the presence of chemicals in daily life 2. Understand presence of chemicals used in food 3. Analyse importance of Vitamins and minerals 4. Think about general medicines 5*. -NA-		
	Theory	Practical	Total
Credits	2	N. A.	2
Contact Hours/week	2	N. A.	2
Internal Assessment Marks	15	N. A.	15
End Term Exam Marks	35	N. A.	35
Examination Time	3hrs		
Maximum Marks: 50			
Part B- Contents of the Course			

Ravi Kant

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Instructions for Paper- Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on

entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Soaps and detergents, cleansing action of soap, Cleansing action of detergents Propellants, Solid propellant, liquid propellants, hybrid propellants dyes: Cause of exhibition of color, chromophore, auxochrome, classification of dyes Advanced chemical materials: Ceramics, Sunscreens	8 Hrs
II	Chemicals used in foods Preservatives, coloring agents, sweetening agents, flavoring agents, antioxidants Chemicals used to grow, protect foods and crops: Fertilizers, Fungicides, Herbicide and Insecticide etc.	7 Hrs
III	Vitamins and minerals Definition, their significance, Fat soluble vitamins Names, daily dietary requirement, natural sources, Deficiency diseases Water soluble vitamins Names, daily dietary requirement, natural sources, Deficiency diseases Minerals Major and Minor nutrients, daily dietary requirement, natural sources, Deficiency diseases	7 Hrs
IV	Chemicals in Medicine Drug - target interaction (enzymes as drug targets and receptors as drug targets), chemical messengers, types of chemical messengers (hormones and neurotransmitters) Chemotherapy antipyretics, analgesics, antidepressants' antiseptics and disinfectants, antiviral drugs, antacids, antimalarial, anesthetics, tranquilizers, hypnotics and sedatives, ant allergic drugs and histamines	8 Hrs
V*	N.A.	
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		

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Internal Assessment: ➤ Theory: 15 ● Class Participation: 04 ● Seminar/presentation/assignment/quiz/class test etc.: 04 ● Mid-Term Exam: 07 ➤ Practicum Nil ● Class Participation: ● Seminar/Demonstration/Viva-voce/Lab records etc.: ● Mid-Term Exam:	End Term Examination: 35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ✓ NCERT Chemistry	

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VAC-4

Session: 2024-25			
Part A – Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Agricultural Chemistry		
Course Code	24UNCHE-VAC401		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VAC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1 Thinks about chemistry involved in agriculture 2 Know about chemical composition of soils; 3 Understand impacts of pollutions on soils and its productivity; 4 Critically think regarding sewage effluents. 5*. N.A.		
	Theory	Practical	Total
Credits	2	N.A.	2
Contact Hours per week	2	N.A.	2
Internal Assessment Marks	15	N. A.	15
End Term Exam Marks	35	N. A.	35
Examination Time	3hrs		
Maximum Marks: 50			
Part B- Contents of the Course			

Instructions for Paper- Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal

marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Plants as producers: Photosynthesis, pesticides, herbicide, insecticide, fungicide, storage and preservation of agriculture produce, food processing.	8 Hrs
II	Soil fertility and soil productivity: urea cycle, Organic and inorganic nitrogen (Haber Bosch Process), nutrient sources – fertilizers and manures; essential plant nutrients - functions and deficiency symptoms, Introduction of Micronutrient	7 Hrs
III	Chemical (elemental) composition of the earth's crust and soils, Chemistry of acid soils; active and potential acidity; lime potential, chemistry of acid soils; sub-soil acidity; Chemistry of salt-affected soils and amendments; soil pH	7 Hrs
IV	Nature and sources of pollutants acid rains, oil spills etc.; air, water and soil pollutants - and effect on plants, animals and human beings. Sewage and industrial effluents – their composition and effect on soil properties/health, and plant growth and human beings; soil as sink for waste disposal.	8 Hrs
V*	N.A.	

Suggested Evaluation Methods
Short Answer and MCQ Type QUESTIONS

Internal Assessment: ➤ Theory: 15 ● Class Participation: 04 ● Seminar/presentation/assignment/quiz/class test etc.: 04 ● Mid-Term Exam: 07 ➤ Practicum Nil	End Term Examination: 35
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Part C-Learning Resources

Ravi Kant

SR

MIO

Samir

Shruti

Recommended Books/e-resources/LMS:

- ✓ Bear RE. 1964. Chemistry of the Soil. Oxford and IBH. Bolt GH & Bruggenwert MGM. 1978. Soil Chemistry. Elsevier. Greenland DJ & Hayes MHB. 1981. Chemistry of Soil Processes. John Wiley & Sons.
- ✓ Brady NC & Weil RR. 2002. The Nature and Properties of Soils. 13 Ed. Pearson Edu.
- ✓ Kabata-Pendias A & Pendias H. 1992. Trace Elements in Soils and Plants. CRC Press.
- ✓ Kannaiyan S, Kumar K & Govindarajan K. 2004. Biofertilizers Technology. Scientific Publ.
- ✓ Leigh JG. 2002. Nitrogen Fixation at the Millennium. Elsevier.
- ✓ Mengel K & Kirkby EA. 1982. Principles of Plant Nutrition. International Potash Institute, Switzerland.
- ✓ Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. Micronutrients in nd Agriculture. 2 Ed. SSSA, Madison.
- ✓ Pierzinsky GM, Sims TJ & Vance JF. 2002. Soils and Environmental nd Quality. 2 Ed. CRC Press.
- ✓ Stevenson FJ & Cole MA. 1999. Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients. John Wiley & Sons.
- ✓ Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. Soil Fertility and th Fertilizers. 5 Ed. Prentice Hall of India.
- ✓ Troeh FR & Thompson LM. 2005. Soils and Soil Fertility. Blackwell.

*Applicable for courses having practical component.

[Handwritten signatures in blue ink: h, M/R, B, Santhi, Jnl, Ravikant]