

CC-4/MCC-6

Session: 2023-24			
Part A - Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Chemistry-IV		
Course Code	B23-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)	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. 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	Theory of Qualitative and Quantitative Analysis Chemistry of analysis of various groups of basic and acidic radicals, chemistry of identification of acid radicals in typical combination, common ion effect, solubility product, theory of precipitation, co-precipitation, post precipitation, purification of precipitates.	11
III	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.	11

	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.	
IV	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. 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
Suggested Evaluation Methods		

