

PANCHAKOT MAHAVIDYALAYA

ISO - 9001:2015, ISO - 14001:2015

NAAC ACCREDITED

Email: panchakotmahavidyalaya@gmail.com

Website: www.panchakotmv.com

SARBARI, NETURIA, PURULIA,

West Bengal – 723121

Course Outcome (CO) of Chemistry

3/4-year Undergraduate Degree Course

(Under NEP-2020)

Course Type	Semester	Course Code	Course Title	Credit	Course Objective	Course Outcomes
MJ-1	1	BCEMMJ01C	Inorganic Chemistry – I	6	The syllabus of Major -1 has been designed to provide the students with the basic ideas of General Inorganic and Physical Chemistry. The four modules consisting of Atomic Structure, Periodic Properties, Acid-Base and Redox reaction	1.1 Gather an in-depth knowledge about atomic structure.1.2 Understand the periodic properties of the elements.1.3 Understand the concepts of a redox reaction.1.4 Explain various phenomenon of redox reaction. 1.5 Practical To learn the Estimation of carbonate and hydroxide present together in mixture. To learn Standardization of KMnO_4 by Oxalic acid. To learn estimation of Fe(II) using standardized KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
MJ-2	2	BCEMMJ02C	Organic Chemistry – I	6	The syllabus of Major -2 has been designed to provide the students with the basic ideas of bonding and hybridization and fundamental understanding of stereochemistry. The six modules consisting of valence bond theory, electronic displacements, Molecular Orbital theory, physical properties of the organic molecules, basic stereochemistry, general reaction mechanism	2.1 Understand the valence bond theory. 2.2 Understand the basics of electronic displacements. 2.3 Understand the concepts of a Molecular Orbital theory.2.4 Understand the physical properties of the organic molecules. 2.5 Understand the basic stereochemistry. 2.6 Understand the general reaction mechanism. 2.7 Practical: Knowledge gain on separation of inorganic and organic compounds. To learn the determination of boiling point of organic compounds Understand the determination of boiling point of organic compounds.
MJ-3	3	BCEMMJ03C	Physical Chemistry – I	6	The syllabus of Major-3 has been designed to provide the students with in-depth ideas on two of the most important aspects of Physical Chemistry: Chemical Thermodynamics and Chemical Kinetics.	3.1 Introduce the basic definitions of Thermodynamics and the concepts of heat, energy, work, and their interrelationship. 3.2 To understand the details of two major Thermodynamic Laws along with their applicability. 3.3 To understand rate laws, rate equations of different types of reactions, determine rate constant values, order of reactions, effect of temperature and other factors on reaction rate, homogenous catalysis, catalytic effect on reaction rate, equations related to chemical catalysis. 3.4 Practical:

						<p>To learn the determination of heat of neutralization of a strong acid by a strong base.</p> <p>Knowledge gain on Study of kinetics of acid-catalyzed hydrolysis of methyl acetate.</p> <p>To learn the study of kinetics of decomposition of H_2O_2 by $FeCl_3$ and Neutral KI method.</p> <p>To understand the determination of partition coefficient for the distribution of I_2 between water and $CHCl_3$.</p>
MJ-4	4	BCEMMJ04C	Inorganic Chemistry – II	6	<p>The syllabus of Major -4 has been designed to provide the students with in-depth knowledge of Chemical bonding, including Ionic bonding, Covalent Bonding, Co-ordinate covalent bonding and other weak bonding interactions and coordination chemistry.</p>	<p>4.1 Thorough understanding of Chemical Bonding with special Emphasis on Ionic, Covalent bonding and Concepts of weak bonds like Hydrogen Bond, van der Waals bond. 4.2 Understanding the Molecular Orbital diagram of H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2. 4.3 To learn the basic concept of coordination chemistry.</p> <p>4.4 Practical: Knowledge gain on the estimation of $Cu(II)$ by Iodometric method. Understand the determination of available Chlorine in bleaching powder by Iodometric method. To learn the estimation of Oxalic acid and Sodium oxalate by $KMnO_4$ and estimation of $Fe(III)$ & $Cu(II)$ by $K_2Cr_2O_7$.</p>
MJ-5	4	BCEMMJ05C	Organic Chemistry – II	6	<p>The syllabus of Major -5 has been designed to provide the students with the basic ideas of organic reaction mechanism and few concepts of organic stereochemistry. The later part includes concepts chiral axis, prostereoisomer</p>	<p>5.1 Understand the aliphatic substitution reactions. 5.2 Understand the basics of elimination reaction. 5.3 Understand the concepts of a Molecular Orbital theory. 5.4 Understand the concepts of basic stereochemistry and reaction mechanism.</p> <p>5.5 Practical: Organic Preparations To learn nitration of aromatic compounds, condensation reactions, hydrolysis of amides/imides/esters, acetylation of phenols/aromatic amines, benzylation of phenols/aromatic amines, side chain oxidation of aromatic compounds, diazo coupling reactions of aromatic amines, bromination of anilides using green approach (Bromate-Bromide method), redox reaction including solid-phase method, Green 'multi-component-coupling' reaction.</p>
MJ-6	5	BCEMMJ06C	Physical Chemistry – II	6	<p>The syllabus of Major-6 is divided into four modules: (1) Kinetic theory of gases; (2) Applications of</p>	<p>6.1 Kinetic Theory of Gases, Behaviour of Real Gases, and Related Theories. 6.2 Thermodynamic rationale of the behaviour of solutions and mixtures, the thermodynamics of different phases of matter, and phase transfer. 6.3 Transport process.</p>

					Thermodynamics-II; (3) Applications of Thermodynamics-II; and (4) Transport Process-I.	6.4 Practical: To learn the determination of K_{eq} for $KI + I_2 = KI_3$, using partition coefficient between water and $CHCl_3$. To understand the study of viscosity of unknown liquid (glycerol, sugar) with respect to water. To learn the potentiometric titration: (a) weak acid vs. base, (b) Redox, determination of E_0 . Knowledge gain on the determination of strength of unknown HCl by NaOH pH-metrically.
MJ-7	5	BCEMMJ07C	Organic Chemistry – III	6	The syllabus of Major -7 has been designed to provide the students with in-depth knowledge of addition reactions of alkenes and alkynes, including aromatic electrophilic and nucleophilic substitution reactions. Detail study on carbonyl and related compounds and organic reaction using organometallic compounds	7.1 Thorough understanding of addition reactions involving alkenes and alkynes. 7.2 Detailed study of various aromatic electrophilic and nucleophilic reactions. 7.3 Detailed study of reactions involving carbonyl related compound and organic reaction using organometallic compounds. 7.4 Practical: To learn the detection of special elements (N, S, Cl, Br) by Lassaigne's test. To understand the detection of aromatic amino ($-NH_2$), aromatic nitro ($-NO_2$), amido ($-CONH_2$, including imide), phenolic $-OH$, carboxylic acid ($-COOH$), carbonyl ($-CHO$ and $>C=O$).
MJ-8	6	BCEMMJ08C	Inorganic Chemistry – III	6	The syllabus of Major -8 has been designed to provide the students with thorough understanding of the Crystal Field Theory, its advantages over VBT, its challenges, and its achievements.	8.1 Thorough understanding of Co-ordination chemistry in the light of VBT, CFT, LFT. 8.2 Understanding of the colour and spectra of co-ordination compounds and their magnetic properties. 8.3 Understand the reaction kinetics and mechanism, radioactivity, noble gases. 8.4 To learn the group chemistry of s- and p- block elements. 8.5 Practical: To learn the standardization of Na_2EDTA by $Zn(II)$ and determination of Hardness of water due to Calcium and Magnesium. Knowledge gain on the preparation of Tris-(ethylenediamine) nickel(II) chloride and $[Fe(acac)_3]$.
MJ-9	6	BCEMMJ09C	Physical Chemistry – III	6	The syllabus of Major 9 has been designed to make the students learn the most modern aspects of Physical Chemistry, such as Quantum Mechanics, Molecular Spectroscopy, Photochemistry, Symmetry and Group Theory	9.1 This module will be helpful in understanding the Fundamentals of Quantum Mechanics, which include the Postulates of Quantum Mechanics, the Concept of Wave Function, the Probabilistic Nature of Quantum Particles. 9.2 Understand the Molecular Spectroscopy, Photochemistry, Symmetry and Group Theory. 9.3 Practical: Knowledge gain on the verification of Beer and Lambert's Law for $KMnO_4$ and $K_2Cr_2O_7$.

						To learn the study of kinetics of $K_2S_2O_8 + KI$ reaction, spectrophotometrically.
MJ-10	6	BCEMMJ10C	Organic Chemistry – IV	6	The syllabus of Major -10 has been designed to provide the students with in-depth knowledge of nitrogen compounds, rearrangement reactions, the logic of organic synthesis i.e, retrosynthetic analysis of organic compounds and organic spectroscopy .	10.1 Thorough understanding of reactions involving nitrogen compounds. 10.2 Detailed study of rearrangement reactions, which includes several organic name reactions.10.3 Detailed study of the logic of organic synthesis and organic spectroscopy like UV, IR, NMR. 10.4 Practical: To learn the estimation of glycine by Sørensen's formol method and estimation of glucose and sucrose by titration using Fehling's solution. Detail study on the estimation of vitamin-C (reduced) and estimation of aromatic amine (aniline) and phenol by bromination (Bromate-Bromide)method. To know the estimation of formaldehyde (Formalin) and estimation of acetic acid in commercial vinegar.
MJ-11	7	BCEMMJ11C	Organic Chemistry – V	6	The syllabus of Major -11 has been designed to provide the students with in-depth knowledge of carbocycles and heterocycles, cyclic stereochemistry, pericyclic reactions, carbohydrates and biomolecules.	11.1 Thorough understanding of carbocycle and heterocycle systems and corresponding reactions. 11.2 Detailed study of stereochemistry of alicyclic compounds and corresponding reactions viz, elimination, substitution reaction. 11.3 Understanding the carbohydrates chemistry, amino acid, peptides and nucleic acid chemistry. 11.4 Practical: To know the Chromatographic separations of organic compounds and spectroscopic analysis of organic compounds
MJ-12	7	BCEMMJ12C	Inorganic Chemistry – IV	6	The syllabus of Major -12 has been designed to provide the students with thorough understanding of the Electron Transport System in Biological Systems, mechanism of Na^+ / K^+ pumps, photosynthesis process and organometallic chemistry, organometallic catalysis and d & f- block chemistry	12.1 Developing the idea and concepts of Bio-inorganic chemistry.12.2 Understanding of Organometallic chemistry from Inorganic point of view. 12.3 Study of catalysis by organometallic compounds. 12.4 Understand the d & f- block chemistry, Transition Elements and Lanthanoids and Actinoids. 12.5 Practical: To know about the qualitative analysis of cation radicals, anion radicals and insoluble materials.
MJ-13	7	BCEMMJ13C	Physical Chemistry – IV	6	The syllabus of Major-13 covers a vast area of details of Crystal Structure, Statistical Thermodynamics, 3rd Law of	The objectives of the present major course are manifold. There are six modules in this course, and the objectives of the modules can be stated as below: 13.1 crystal structure determination and understanding the statistical thermodynamics, transport process, surface chemistry and colloids.

					Thermodynamics and Surface Chemistry.	<p>13.2 Practical:</p> <p>To learn the determination of surface tension of a liquid using Stalagmometer.</p> <p>Knowledge gain on the determination of solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator).</p> <p>To know the conductometric titration of a strong / weak acid and dibasic acid by strong base.</p>
MJ-14	8	BCEMMJ14C	Inorganic Chemistry – V	6	The syllabus of Major -14 has been designed to provide the students with thorough understanding of Analytical Chemistry, the basic principles of UV-Vis & IR spectroscopy and Separation techniques	<p>14.1 Understanding and application of Sampling & Errors in Quantitative Analysis. 14.2 Understanding and application of Lambert-Beer's Law. 14.3 Understanding the basic principles of UV-Vis & IR spectroscopy. 14.4 To learn the thermal methods of analysis, electroanalytical methods, separation techniques.</p> <p>14.5 Practical:</p> <p>To know about the determination of Fe(III) content in cement and chromatographic separation of amino acids and chromatographic separation of Ni & Co using paper chromatography.</p> <p>To understand the estimation of Ascorbic Acid in Vitamin-C by Iodometric method.</p>
MJ-15	8	BCEMMJ15C	Physical Chemistry – V	6	This major has five modules that focus on (1) Angular Momentum, (2) Chemical Kinetics, (3) Catalysis, (4) Application of Computers in chemistry, and (5) Nanomaterials.	<p>15.1 This chapter includes the method of constructing the Hamiltonian and Schrodinger Equations for different quantum mechanical systems. 15.2 Understanding the different mathematical techniques involved in chemical kinetics and catalysis. 15.3 Understanding application of Computers in Chemistry and Nanomaterials.</p> <p>15.4 Practical:</p> <p>To Know about the study of phenol-water phase diagram and study of the Effect of the PKSE on the kinetics of $K_2S_2O_8 + KI$ reaction (bytitrimetric method).</p> <p>To learn about the plotting of differential values of data obtained from conductometric titration and potentiometric titration using MS-Excel/Origin.</p> <p>To know about the plotting of differential values of data obtained from pH-metric titration using MS-Excel/ Origin</p>

MJ-16	8	BCEMMJ16C	Inorganic Chemistry – VI	4	The syllabus of Major -16 has been designed to provide the students with the industrial application of chemistry. This course will empower the students with the knowledge of preparation of Glass, Ceramics, Cement, Fertilizer, Surface Coatings, Alloys.	16.1 Understanding the basic principles of UV-Vis, IR, Mass, ESR & Raman spectroscopy.16.2 Understanding of preparation of glass, ceramics and silicates. 16.3 To learn about the Fertilizer, Surface Coatings, Alloys. 15.4 Practical: To understand the preparation of Zinc Oxide pigment and estimation of Calcium in Calcium Ammonium Nitrate fertilizer and analysis of Cement.
MJ-17	8	BCEMMJ17C	Physical Chemistry – VI	4	This major has four modules to cover. The following are the individual objectives of the respective modules. This major is, to some extent, an advanced-level course required for the next level of higher studies.	17.1This particular module focuses mainly on the understanding and analysis of NMR/ PMR spectroscopy. The chapter discusses mainly topics like chemical shift and shielding, spin interactions, and equivalent protons. 17.2 To learn about the Group theory, Quantum mechanics, Atomic spectra 15.4 Practical: Understand the Job's Method using Fe-Phenanthroline/ Fe-Salicylic acid complex by colorimetric / spectrophotometric method. To learn about the Mole Ratio method using Fe-Phenanthroline/ Fe-Salicylic acid complex by colorimetric / spectrophotometric method. To understand the determination of Rate Constant of Inversion of Cane sugar by polarimetric method.
MJ-18	8	BCEMMJ18C	Organic Chemistry – VI	4	The syllabus of Major -18 has been designed to provide the students with in-depth knowledge of Structure-reactivity relationship, application of spectroscopy including NMR and Mass spectroscopy. Detailed study of NMR and Mass spectroscopy and Photochemistry.	18.1 Thorough understanding of Structure-reactivity relationship in the light of Hammett equation and Taft equation. 18.2 Detailed study of NMR and Mass spectroscopy and determination of structure of organic molecules by NMR and Mass spectroscopy. 18.3Understand the Photochemistry of organic compounds. 18.4 Practical: To learn about the Synthesis of organic compounds involving: Nitration, diazotization, Photochemical reaction, Sandmeyer reaction, Pinacol-pinacolone rearrangement, Claisen rearrangement etc.