Khandesh Education Society's
Pratap College, Amalner.
Autonomous

CGPA 3.52 'A^{+}'

Re-Accredited (3rdCycle)

Amalner-425401, Maharashtra, (India)

B.Sc Second Year (Chemistry)
Semester III & IV

2025-26

S.Y.B.Sc. Chemistry Syllabus (NEP-2020) w.e.f. 2025-26
Department of Chemistry, Pratap College Amalner Autonomous

S.Y.B.Sc. Chemistry Course Credit Structure
Semester - III

Sr. No	Course Category	Name of the course (Title of the Paper)		Total Credit	Hours/Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
						Theory	Practical	(CA)	(UA)	Duration of Examination(Hrs)
						T	P			
1	Mandatory DSC	DSC - 5 (2) T	CH-MJ-231 Physical and Inorganic Chemistry-I	2	30	2	-	20	30	1.5
		DSC - 6 (2) T	CH-MJ-IKS-232 Ancient Indian Chemistry	2	30	2	-	20	30	1.5
		DSC - 7 (2) P	CH-MJP-233 Physical and Inorganic Chemistry Practical-I	2	60	-	2	20	30	3
2	SEC	SEC-1 (2) T	CH-SEC-234 Organic and Analytical Chemistry-I	2	30	2		20	30	1.5
		SEC-2 (2) P	CH-SECP-235 Organic and Analytical Chemistry Practical-I	2	60	-	2	20	30	3
3	Minor subjects (MIN)	MIN-1 (2) T	CH-MN-236A General Chemistry	2	30	2	-	20	30	1.5
		MIN-2 (2) T	CH-MN-236B (2) T: Basic Analytical Chemistry	2	30	2	-	20	30	1.5
		MIN-2 (2) P	CH-MN-236C General and Analytical Chemistry Practical-I	2	60	-	2	20	30	3
4	GE/OE	OE (2) T	CH-OE-237 Environmental Awareness for Chemistry	2	30	2		20	30	1.5
5	AEC	AEC-1(2) T	AEC-238A- Marathi	2	30	2		20	30	1.5
		AEC-1(2) T	AEC-238B- Hindi	2	30	2		20	30	1.5
6	CC-1	CC-1(2) T	CC-239A- NCC-III/ CC-239B- NSS-III/ CC-239C- Yoga-III/ CC-239D- Sports-III/ CC-239E- Students Welfare-III	2		2				
			Total	**22**		**14**	**08**			

Semester – IV

Sr. No	Course Category	Name of the course (Title of the Paper)		Total Credit	Hours/Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
						Theory	Practical	(CA)	(UA)	Duration of Examination(Hrs)
						T	P			
1	Mandatory DSC	DSC - 8 (2) T	CH-MJ-241 Physical and Inorganic Chemistry-II	2	30	2	-	20	30	1.5
		DSC - 9 (2) P	CH-MJP-243 Physical and Inorganic Chemistry Practical –II	2	60	-	2	20	30	3
2	OJT/Int/FP/ CEP	CEP	CH-CEP-242 Chemistry and Society	4	60	-	2	20	30	3
3	VC	VC-1 (2) T	CH-VC-244 Organic and Analytical Chemistry-II	2	30	2		20	30	1.5
		VC-2 (2) P	CH-VCP-245 Organic and Analytical Chemistry Practical-II	2	60	-	2	20	30	3
3	Minor subjects (MIN)	MIN-1 (2) T	CH-MN-246A Advanced Analytical Chemistry	2	30	2	-	20	30	1.5
		MIN-2 (2) P	CH-MN-246B Advanced Analytical Chemistry Practical	2	60	-	2	20	30	3
4	GE/OE	OE (2) T	CH-OE-247 Waste Management	2	30	2		20	30	1.5
5	AEC	AEC-1(2) T	AEC-248A- Marathi	2	30	2		20	30	1.5
		AEC-1(2) T	AEC-248B- Hindi	2	30	2		20	30	1.5
6	CC-1	CC-1(2) T	CC-249A- NCC-III/ CC-249B- NSS-III/ CC-249C- Yoga-III/ CC-249D- Sports-III/ CC-249E- Students Welfare-III	2		2				
			Total	**22**		**14**	**08**			

Important points:

i. For theory courses one credit is equivalent to 15 lectures of 60 minutes each and for practical courses one credit is equivalent to 30 lectures of 60 minutes each.
ii. There will be 12 practical sessions per semester of 4 hours each.
iii. Total weeks for teaching and internal evaluation are 15. Out of the 15weeks, 12 weeks are for teaching and 03weeks for internal evaluation (Theory as well as Practical).

Abbrevations

- **T- Theory Course, P – Practical course, DSC- Discipline Specific Core Course, DSE- Discipline Specific Elective Course, MIN – Minor subject.**
- **Major DSC (Mandatory):** is the subject that represents the main focus of the degree, and the degree will be awarded in that Subject. Students should secure a minimum 50% of total credits through Major (core) Courses (mandatory courses, electives, vocational courses, Internship/ Field Projects/ Apprenticeship/Community Engagement Projects, Seminars, and Group Discussion. In addition, Entrepreneurship, IPR and Research Project shall be offered in case of Honours with Research Degree) in Three /Four Years for the award of Major Degree.
- **Minor:** is the subject that may complement the Major subject or can have interdisciplinary bandwidth. Minor subject may be related or unrelated to the Major subject. The Minor subjects may be from the different disciplines of the same faculty of DSC Major (Core) or they can be from different faculty altogether.
- **GE/OE:** is to be chosen compulsorily from faculty other than that of the Major and from the faculty-wise baskets of OE prepared by University/Colleges.
- **SEC** (Skill Enhancement Courses) to be selected from the basket of Skill Courses approved by university.
- **VSC** (Vocational Skill Courses): including Hands on Training corresponding to the Major and/or Minor Subject, to be selected from the basket. Wherever
- Applicable vocational courses will include skills based on advanced laboratory practicals of Major.
- **AEC** (Ability Enhancement Courses): English: 04Credits, Modern Indian Language:04 credits,
- **VEC** (Value Education Courses): to be chosen from the courses, such as; Understanding India, Environmental Science/Education, and Digital and Technological Solutions,
- **CC:** (Co-curricular Courses): to be chosen from the courses, such as; Health and Wellness, Yoga education, Sports and fitness, Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts.
- **FP/CEP:** Field Projects/Community Engagement and Service corresponding to the Major (Core) Subject.
- **OJT:** On Job Training: Internship/ Apprenticeship.
- **RM:** Research Methodology.
- **RP:** Research Project.

DSC 5 (2) T: CH-MJ-231 Physical and Inorganic Chemistry-I		
Unit No.	**Title and Content**	**L & M**
1	**Solutions** Introduction, Solubility, Factors affecting solubility, Types of solutions, Different way of expressing the concentration of solution, Ideal and non-ideal solutions, Raoults law and its limitation, The vapour pressure of actual liquid pairs the vapour pressure of ideal solution. Classification of binary solution of completely miscible liquids (Type-I, Type-II and Type-III) on the basis of Raoults law), Solubility of partially miscible liquid pairs, Phase diagram Phenol-water system **Ref.1: Pages 261-264,270-286,288-291** **Ref. 2, 3, 4 Relevant Pages**	**L-10, M-10/15**
2	**Colligative Properties** Introduction, Lowering of vapour pressure of solvent, Calculation of molecular weight of solute from Lowering of vapour pressure of solvent. Freezing point depression of solution, Calculation of molecular weight of solute from depression in Freezing point, Osmosis and osmotic pressure, Relation of osmotic pressure to vapour pressure, Landberger's method for the determination of elevation of boiling point, related numerical. **Ref.-1:- Pages 312-324, 325-330** **Ref. 2, 3, 4 Relevant Pages**	**L-10, M-10/15**
3		**L-10, M-10/15**

References

1. Principles of Physical Chemistry by S. H. Maron and C. F. Prutton (4th edition) 2015
2. Essentials of Physical Chemistry by B. S. Bahl, G. D. Tuli, ArunBahl, S. Chand (25th edn) Dec. 2010
3. Elements of Physical Chemistry S. Glasstone and D. Lewis (Macmillan Press Ltd.) (2nd edn) 2014
4. Physical Chemistry by Robert A. Alberty (John Willey and Sons) (7th edition) 1992
5. Concise Inorganic Chemistry by J.D.Lee.5th Edition. 2014
6. Principles of Inorganic Chemistry By Sharma, PuriKalia 30th edition Milestone Delhi. 2017
7. Advanced Inorganic Chemistry Volume - I, by Gurdeep Raj 23rd edition, Goel Publishing House, Meerut. 2016
8. Practical chemistry (for B.Sc. I, II- and III-year students) – O P Pandey, D. N. Bajpai and S. Giri (S Chand and company Ltd)

DSC 6 (2) T: CH-MJ-IKS-232 History of Chemistry IKS: Indian Knowledge System		
Unit No.	**Title and Content**	**L & M**
1	Chemistry in the ancient period: Introduction and general remarks,chemistry timeline, Concept of materials and their importance in Indian,Greek, Roman, and Chinese civilizations, Alchemy, differences in alchemy and modern chemistry	**L:08, M:08**
2	Chemistry in the Enlightenment Period: Works of Robert Boyle,Lavoisier, and the developments of Chemistry upto the IndustrialRevolution, historical developments in the fields of chemicalthermodynamics, electrochemistry (Faraday, etc.), organic chemistry,developments in the fields of inorganic chemistry, chemical reactions, and evolution in writing them, the evolution of chemistry as a bridging sciencebetween physics, biology etc.	**L:14, M:14**
3	Philosophical and Critical Biographies of few Scientists: (1) Charak,(2) Antione Lavoisier, (3) P. C. Ray, (4) Marie Curie, (5) Michael Faraday	**L:08, M:08**

DSC-7 (2) P: CH-MJP-233 Physical and Inorganic Chemistry Practical-I	
Practical No.	**Title and Content**
Physical Chemistry Experiments (Any 2)	
1	Determination of critical solution temperature of phenol-water system
2	Determination of normality and strength of HCl titrating with standard NaOH Potentiometrically.
3	Determination of molecular weight of liquid by steam distillation technique
VOLUMETRICANALYSIS (Any 5)	
1	Estimation of acetic acid in commercial vinegar using NaOH.
2	Estimation of aspirin in drug sample.
3	Estimation of chloride by Mohr's method.
4	Estimation of Fe (II) by redox titration with KMnO4.
5	Estimation of copper iodometrically.
6	Estimation of Mg+2 by complexometric titration with EDTA.
7	Determination of dissolved oxygen (DO) in water sample.
Inorganic Preparations: (Any 3)	
1	Preparation of ferrous ammonium sulphate (Mohr's salt)
2	Preparation of tetrammonium copper (II) sulphate
3	Preparation of chloropentammine cobalt (III) chloride
4	Preparation of Nickel dimethyl glyoximate using microscale method
5	Preparation of Tris (ethylenediamine)nickel (II) thiosulphate
6	Preparation of Hexamine Ni (II) Chloride

SEC-1 (2) T: CH-SEC-234 Organic and Analytical Chemistry-I

Unit No.	Title and Content	L & M
1	**Stereoisomerism** a) Isomerism, classification of isomerism, stereoisomerism, types of stereoisomerism. b) **Projection formulae-** Fischer projection formula, Newman projection formula, Saw horse formula. c) **Optical isomerism-** Optical activity, enantiomerism, chiral centre and chirality, elements of symmetry, dextrorotatory, laevorotatory, Configuration: R and S nomenclature system. d) **Geometrical isomerism-** Geometrical isomers, condition for geometrical isomerism, nomenclature systems: Cis and Trans, E and Z. e) **Conformational isomerism-** Conformational isomers, conformational isomerism in n- butane with energy profile diagrams. **(Use of models / ICT are expected for teaching this chapter)** **Ref 2, 3, 4 (Relevant pages)**	**L-12, M-12 / 18**
2	**Heterocyclic aromatic compounds** **a) Five membered ring with one heteroatom** Introduction, preparation of furan, pyrrole and thiophene. Reactions: nitration, sulphonation, F C acylation, Reimer Tiemann reaction, catalytic hydrogenation. **b) Six membered ring with one heteroatom** Preparation of pyridine: from acrolein and from acetylene. Reactions: nitration, sulphonation, bromination, catalytic hydrogenation. **Ref. 1, 2, 5, 6, 8 (Relevant pages)**	**L-08, M-08/12**
3	**Introduction to Analytical Chemistry (L-10, M-20/28)** a) Introduction: Analytical chemistry, its interdisciplinary nature, importance of analytical chemistry, types of analysis: qualitative and quantitative analysis b) Concept of sampling, definition, procedure of sampling, types of sampling c) Accuracy, precision, significant figures, significance of zero, rounding off **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L-10, M-10 / 15**

Reference Books

1) Organic chemistry - Francis A Carey (3rd Edition) 2017
2) Organic chemistry - Morrison and Boyd (6thEdition) 2018
3) Stereochemistry of organic compounds- E L Eliel 2008
4) Stereochemistry of organic compounds- P S Kalsi 2009
5) Organic chemistry - Stanley H pine (5th Edition) 1987
6) A Text book of Organic chemistry- ArunBahl and B S Bahl, S Chand publication.2016
7) A guide book to reaction mechanism in organic chemistry by Peter Sykes.5th Ed. 2003
8) Heterocyclic compounds by Leo Packet. 2006
9) Basic Inorganic chemistry 3rd edition by F.A. cotton, G. Wilkinson, Paul Guss John Wiley and Sons. 2007
10) Theoretical principals of Inorganic chemistry by G.S. Manku, Tata Mc. Graw Hill edition.
11) Advanced Inorganic chemistry by Gurudeep Raj., Vol. I, 23rd Edition, Goel publishing House Meerut.2015

SEC-2 (2) P: CH-SECP-235 Organic and Analytical Chemistry Practical-II	
Practical No.	**Title and Content**
Organic Chemistry Experiments (Any 04)	
1	Preparation of benzoic acid from benzamide.
2	Preparation of p-nitro acetanilide from acetanilide.
3	Preparation of Phthalimide from Phthalic anhydride.
4	Preparation of dihydropyrimidone from benzaldehyde, ethyl acetoacetate and Urea.
5	Preparation of Dibenzalpropanone from benzaldehyde and Acetone.
6	Preparation of Orange II from sulphanilic acid.
	Derivatives (Any 02)
1	Benzoyl derivative of NH_2/ OH
2	2,4-DNP derivative of >C=O
3	Semicarbazone derivative of aldehydes / ketones
4	Benzaldehyde to dibenzalpropanone using NaOH.
	Titrimetric Estimations: (Any 02)
1	Preparation of tetrammine copper (II) Sulphate
2	Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA
3	To determine volumetrically the amounts of sodium carbonate and sodium hydroxide present together in the given solution.
	Chromatographic techniques (Any 02)
1	Separation of mixture of o-nitroaniline and p-nitroaniline by thin layer chromatography and determine their Rf value.
2	Separation of mixture of any 2 amino acid by paper chromatography
3	Separation of mixture of 2 sugars by paper chromatography

MIN-1 (2) T: CH-MN-236A General Chemistry		
Unit No.	**Title and Content**	**L & M**
1	**Instrumentation Techniques:** Basic principle of i] pH meter ii] Potentiometer and iii] Conductometer. Conductance measurement- Direct reading conductivity bridge, conductivity cell and cell constant Conductometric Titrations: Introduction, Instrumentation Types of conductometric Titrations, Advantages and disadvantages of conductometric Titrations. UV – Visible Spectrometry: Basic principles, instrumentation (choice of source, monochromator and detector) for single and double beam instrument. Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques	**L: 14 M: 14/21**
2	**Qualitative Analysis:** Qualitative Analysis-Principle of qualitative analysis Classification of organic and inorganic qualitative analysis Organic Qualitative Analysis-Identification of compounds, the functional group analysis Inorganic Qualitative Analysis-Application of solubility product and common ion effect, separation of cation into groups, Application of complex formation, Application of oxidation–reduction in inorganic qualitative analysis Choice of groups reagents & group analysis. Interfering anions (Flurate, borate, oxalate & phosphate),	**L: 08 M: 08/12**
3	**Quantitative Analysis:** Quantitative Analysis-Definition & types of Quantitative analysis Volumetric Analysis: Basic definitions, Types of titrations Gravimetric Analysis: Introduction, types of gravimetric analysis Steps in Gravimetry-Precipitation technique with respect to theory, Solubility consideration; common ion effect; diverse Ion effect; pH Temperature and nature of solubility, Digestion, Nucleation, co & post precipitation, Filtration & washing, Drying & Ignition	**L: 08 M: 08/12**

CH-MN-236B (2) T: Basic Analytical Chemistry		
Unit No.	**Title and Content**	**L & M**
1	**Chapter 1: Introduction to Analytical Chemistry (L-10, M-20/28)** a) Introduction: Analytical chemistry, its interdisciplinary nature, importance of analytical chemistry, types of analysis: qualitative and quantitative analysis b) Concept of sampling, definition, procedure of sampling, types of sampling c) Accuracy, precision, significant figures, significance of zero, rounding off **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L:10** **M:10**
2	**Chapter 2: Acid base titrations (L-06, M- 12/20)** a) Study of following acid base titrations with respect to: neutralization curve, selection of indicators and calculation of P_H i) Strong acid versus strong base ii) Weak acid versus strong base **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L:10** **M:10**
3	**Chapter 3: Precipitation titrations (L-06, M- 12/18)** a) Principle, precipitation titration curve**,** use of indicators in detection of end point. b) Preparation of $AgNO_3$ solution, its standardization by Mohr's method. **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L: 04,** **M: 04**
4	**Chapter 4: Chromatography (L-08, M-16/24)** a) Definition, Introduction, advantages and disadvantages of chromatography. b) Principle of chromatography, classification of chromatography - partition, adsorption and ion exchange chromatography. c) Paper chromatography: principle, technique, Rf value, ascending and descending techniques, paper chromatographic separation of metal ions, applications. **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L:06,** **M: 06**

MIN-3 (2) P: CH-MNP-236C General and Analytical Chemistry Practical	
Practical No.	**Title and Content**
Inorganic Qualitative Analysis (Any 3 or 4 compounds)	
1	Inorganic Qualitative Analysis (One Acidic and One Basic Radical)
Organic Chemistry Experiments (Any 3 or 4 compounds)	
1	Organic Qualitative Analysis with respect to following analysis 1) Type determination 2) Preliminary tests 3) Physical constant 4) Functional group tests (Structural formula not expected)
Analytical Chemistry Experiments (Any 3 or 4)	
1	Preparation of standard 0.1N Na_2CO_3 solution and standardization of HCl solution.
2	Preparation of 0.1 N oxalic acid solution and standardization of $KMnO_4$ solution.
3	Preparation of 0.1 N $Na_2S_2O_3$ solution and estimation of Cu (II) ions iodometrically.
4	Determine the normality and strength of HCl using HCl Vs NaOH titration using indicator
5	Determine the normality and strength of CH3COOH using CH3COOH Vs NaOH titration using indicator

CH-OE-237 (2) T: Environmental Awareness for Chemistry		
Unit No.	**Title and Content**	**L & M**
1	**Introduction to Environmental Issues:** 1.1 Pollution (Air, Water and Land), 1.2 Fresh water overuse 1.3 Natural disasters 1.4 Fuel and Energy storage due to overuse 1.5 Increase in wasteland, Biodiversity loss, Global warming and climate change	**L: 10 M: 10/15**
2	**Basic Environmental Laws and Ethics:** 2.1 Environmental Protection Act, 2.2 Wildlife Protection Act, 2.3 Forest Conservation Act, 2.4 Prevention and Control of Pollution Act of protection from unsustainable to sustainable development, 2.5 Responsibilities of an Environmentally aware citizen	**L: 10 M: 10/15**
3	**Role of Chemistry in Meeting the Sustainable Development Goals:** 4.1 Green Chemistry Principles 4.2 Study of different chemical reactions by using green chemistry principles. 4.3 Green Methods in practicals-Use of Microkits in reactions, two burette system etc. 4.4 Green Equipments for Energy saving-Applications of Sonicator, Fuming Hood, Ultrasonic Probe, ETP, Microwave,	**L: 10 M: 10/15**

SEM-IV

Sr. No	Course Category	Name of the course (Title of the Paper)		Total Credit	Hours/Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
						Theory	Practical	(CA)	(UA)	Duration of Examination(Hrs)
						T	P			
1	Mandatory DSC	DSC - 8 (2) T	CH-MJ-241 Physical and Inorganic Chemistry-II	2	30	2	-	20	30	1.5
		DSC - 9 (2) P	CH-MJP-243 Physical and Inorganic Chemistry Practical –II	2	60	-	2	20	30	3
2	OJT/Int/FP/ CEP	CEP	CH-CEP-242 Chemistry and Society	4	60	-	2	20	30	3
3	VC	VC-1 (2) T	CH-VC-244 Organic and Analytical Chemistry-II	2	30	2		20	30	1.5
		VC-2 (2) P	CH-VCP-245 Organic and Analytical Chemistry Practical-II	2	60	-	2	20	30	3
3	Minor subjects (MIN)	MIN-1 (2) T	CH-MN-246A Advanced Analytical Chemistry	2	30	2	-	20	30	1.5
		MIN-2 (2) P	CH-MN-246B Advanced Analytical Chemistry Practical	2	60	-	2	20	30	3
4	GE/OE	OE (2) T	CH-OE-247 Waste Management	2	30	2		20	30	1.5
5	AEC	AEC-1(2) T	AEC-248A- Marathi	2	30	2		20	30	1.5
		AEC-1(2) T	AEC-248B- Hindi	2	30	2		20	30	1.5
6	CC-1	CC-1(2) T	CC-249A- NCC-III/ CC-249B- NSS-III/ CC-249C- Yoga-III/ CC-249D- Sports-III/ CC-249E- Students Welfare-III	2		2				
			Total	**22**		**14**	**08**			

DSC 8 (2) T: CH-MJ-241 Physical and Inorganic Chemistry-II		
Unit No.	**Title and Content**	**L & M**
1	**1. Electrochemistry (L-10, M-10/15)** Introduction, Electromotive force and its measurements , Reversible and Irreversible Cells, Standard cell ,Cell reaction and EMF, convention regarding sign of EMF, Single electrode potential, Standard hydrogen and calomel reference electrodes, Calculation of single electrode potential, Calculation of cell EMF from single electrode potential, Related numerical. **Ref.-1:- Pages 481-497** **Ref.-2:- Relevant Pages.** **Ref.-3:- Relevant Pages.**	**L-10, M-10/15**
2	**2. The d-block elements (L-10, M-10/15)** Elements of first, second and third transition series, General characteristics of d-block elements a) Molar volume and densities b) Atomic and ionic radii c) Melting and boiling points d) Ionization Energies e) Oxidation states f) Colour g) Magnetic properties **Ref. 5-653-671** **Ref. 6 -615 -624** **Ref. 7-1128-1143**	**L-10, M-10 / 15**
3	**3: Basic concepts of coordination chemistry (L-10, M-10 / 15)** Double salts and coordination compounds, co-ordination complexes and complex ions, coordination number, Unidentate, bidentate and polydentate ligands, chelating ligand and chelates, physical methods used in study of complex, Nomenclature of coordination compounds. Application of chelation with respect to chelating agents - EDTA and DMG **Ref. - 5:Page Nos. 729-735, 738-741.** **Ref. -6: Relevent Pages.**	**L-10, M-10 / 15**
	Reference books **1.** Principles of Physical Chemistry S. H. Maron and C. F. Prutton (4th edition) 2012 **2.** Essentials of Physical Chemistry B. S. Bahl, G. D. Tuli, ArunBahl (S. Chand and Co Ltd.) (25th edition) 2010 **3.** Elements of Physical Chemistry S. Glasstone and D. Lewis (The Macmillan Press Ltd.) (2nd edition) 2014 **4.** Physical Chemistry Robert A. Alberty (John Willey and Sons) (7th edition) 1992 **5**. Principals of Inorganic Chemistry by B.R.Puri, L.R. Sharma, K.C. Kalia, Milestone publishers and distributors. 2017 **6**. Concise Inorganic Chemistry by J. D.Lee. 5th Edition. 2014 **7**. Theoretical Principles of Inorganic chemistry by G.S.Manku Tata McGraw Hill edition.1982 **8**. Principles of Inorganic Chemistry By Sharma, PuriKalia 30th edition Milestone Delhi. 2017 **9**. Advanced Inorganic Chemistry Volume - I , by Gurdeep Raj 23rd edition , Goel Publishing House, Meerut. 2016	

DSC 9 (2) P: CH-MJP-243 Physical and Inorganic Chemistry Practical –II	
Practical No.	**Title and Content**
PHYSICAL CHEMISTRY EXPERIMENTS (Any 3)	
1	Determination of molecular weight of solute (acetanilide / m- dinitrobenzene / sulphur) by depression of freezing point method.
2	Determination of molecular weight of non-volatile solute (KCl/ BaCl2/ Urea) by using Landsberger apparatus.
3	Determination of standard electrode potential of Cu/Cu+2 or Ag/Ag+, Zn/Zn+2 electrodes potentiometrically.
4	Conductometric titration of Pb(NO3)2Vs Na2SO4
INORGANIC QUALITATIVE ANALYSIS (Any 7 compounds)	
1	Inorganic Qualitative analysis (2 basic radicals with common acidic radical)

VC-1 (2) T: CH-VC-244 Organic and Analytical Chemistry-II		
Unit No.	**Title and Content**	**L & M**
1	**Synthetic Reagents** Introduction, active methylene group **a) Acetoacetic ester** Preparation of acetoacetic ester. Synthesis of- alkyl acetic acid, dialkyl acetic acid, succinic acid, adipic acid **b) Malonic ester** Preparation of malonic ester. Synthesis of- alkyl acetic acid, dialkyl acetic acid, succinic acid, glutaric acid **Ref. 1, 2, 5, 6 (Relevant pages)**	**L-10, M-10 / 15**
2	**Organometallic compounds** a) Nomenclature of organometallic compounds. b)**Organolithium compounds** Preparation of organolithium compounds, Preparation of alcohols from organolithium compounds. c) **Organomagnesium compounds** Preparation of Grignard's reagent, reactions of Grignard's reagent with- esters, acid chlorides, with compounds containing active hydrogen. d) **Organozinc compounds** Preparation of organozinc compounds, synthesis of cyclopropanes (Simmon Smith reaction), Reformatsky reaction. **Ref. 1, 2, 5, 6 (Relevant pages)**	**L-10, M-10 / 15**
3	**Complexometric titrations (L-08, M- 16/24)** a) Complexes, ligands, types of ligands, chelates, chelating agents. b) Formation of complex, formation constant. c) Chelating agent EDTA, EDTA equilibria, EDTA titration curve. d) Detection of end point- use of indicators, principle involved in colour change of indicator, characteristics of metal ion indicators. **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L-10, M-10 / 15**
	Reference Books 1)Organic chemistry - Francis A Carey (3rd Edition) 2017 2) Organic chemistry - Morrison and Boyd (6thEdition) 2018 3)Stereochemistry of organic compounds- E L Eliel 2008 4)Stereochemistry of organic compounds- P S Kalsi 2009 5)Organic chemistry - Stanley H pine (5th Edition) 1987 6) A Text book of Organic chemistry- ArunBahl and B S Bahl, S Chand publication. 2016 7)A guide book to reaction mechanism in organic chemistry by Peter Sykes.5th Ed.2003	

VC-2 (2) P: CH-VCP-245 Organic and Analytical Chemistry Practical-II	
Practical No.	**Title and Content**
ORGANIC QUALITATIVE ANALYSIS (Any 8 compounds)	
	Determination of a) Type b) Preliminary tests c) Physical constant d) Elements (Sodium fusion test) e) Functional groups f) Structure
	GRAVIMETRIC ANALYSIS (Any 2)
1	Estimation of Ni as Ni-DMG (by Counterpoise method)
2	Estimation of Ba as $BaSO_4$ (by Ignition using filter paper)
3	Estimation of Pb as $PbCrO_4$ (by Gooch crucible / counterpoise method)

CH-MN-246A (2) T: Advanced Analytical Chemistry		
Unit No.	**Title and Content**	**L & M**
1	**Chapter 1: Redox titrations (L-10, M-20/30)** a) Oxidation, reduction, redox reaction, oxidising agents, reducing agents, redox titrations. b) Titration of Ce (IV) versus Fe (II), nature of titration curve, calculation of emf during titration. c) Detection of end point- redox indicators, self indicator and starch indicator. **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L:10 M:10/15**
2	**Chapter 2: Complexometric titrations (L-08, M- 16/24)** a) Complexes, ligands, types of ligands, chelates, chelating agents. b) Formation of complex, formation constant. c) Chelating agent EDTA, EDTA equilibria, EDTA titration curve. d) Detection of end point- use of indicators, principle involved in colour change of indicator, characteristics of metal ion indicators. **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L:08 M:08/12**
3	**Chapter 3: Gravimetric analysis (L-12, M- 24/36)** a) Introduction, advantages of gravimetric analysis b) Solubility product (with problems), conditions for precipitation. c) Steps of gravimetric analysis: Preparation of solution, precipitation, digestion. Impurities in the precipitate: co-precipitation and post precipitation. Filtration, washing, drying or ignition, weighing **Ref. 1, 2, 3, 4, 5 (Relevant pages)**	**L: 12, M: 12/18**
	Reference Books 1) Analytical chemistry – G D Christian (5th Edition). 2006 2) Quantitative chemical analysis- J Mendham, R C Denny, Barnes, Thomas 2009 3 Analytical chemistry- D A Skoog, D M West, F J Holler 1992 4) Vogel's text book of quantitative inorganic analysis- Bassett, Denney, Jeffrey 1989 5) Basic concepts of analytical chemistry- S M Khopkar. 2008	

CH-MN-246B Advanced Analytical Chemistry Practical	
Practical No.	**Title and Content**
Analytical Chemistry Experiments (Any 10)	
1	Gravimetric estimation of iron as ferric oxide from the given solution of ferrous ammonium sulphate and free sulphuric acid.
2	Gravimetric estimation of barium as barium sulphate from the given solution containing barium chloride and free hydrochloric acid
3	Gravimetric estimation of Ni as Ni-DMG. 4 Gravimetric estimation of Al as Al oxalate.
4	Determination of the percentage composition of liquid mixture by viscosity method.
5	Determination of cell constant of a conductivity cell using standard KCl (N/10 or N/50 KCl solution).
6	Gravimetric Analysis (volatilization gravimetric analysis) Binary Mixture 1) NH_4Cl + $BaSO_4$ 2) ZnO + $ZnCO_3$
7	Gravimetric estimation of Fe as ferric oxide from the given solution of FAS and free sulphuric acid.
8	Preparation of standard 0.1 N $KMnO_4$ solution and determine the strength of given oxalic acid solution.
9	Determination of quantity of Fe (II) ions from the given solutions by titrating with 0.1 N $K_2Cr_2O_7$ solutions by using internal indicator.
10	Preparation of tetraamine Cu (II) sulphate.
11	Preparation of ferrous ammonium sulphate (FAS).
12	Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA
13	Determination of total hardness of water using 0.01M EDTA solution
14	To determine volumetrically the amounts of sodium carbonate and sodium hydroxide present together in the given solution.
15	Oxidation-ReductionTitrations a.Estimation of Fe(II)/Fe(III) by $KMnO_4$ solution.

CH-OE-247 (2) T: Industrial Chemistry		
Unit No.	**Title and Content**	**L & M**
1	**Fertilisers**: Different types of N and P fertilizers, manufacture of ammonia, ammonium nitrate, urea phosphates and superphosphates. Nitrogen fixation by plants. **Glass**:Various types of glass fibers, optical glass, glazing and vitrification, glass ceramics. **Cement**:Various types of cement, their composition and manufacture. Portland cement, setting of cement. Paints: Constituents of different paints, Role of binder and solvent, Lead and Zinc containing paints, common use of paints	**L:30 M: 30/45**

External Examination Pattern
Chemistry Practical Semester I/ II (CH-103/203)

Time: 3 Hrs.	**Marks 30**
Q. 1. Physical Chemistry / Analytical Chemistry experiment	20 Marks
OR	
Inorganic/ Organic Qualitative analysis	
Q. 2. Oral	05 Marks
Q. 3.Journal	05 Marks
Total:	**30 Marks**

Internal Examination Pattern
Chemistry Practical Semester I/ II (CH-103/203)

Time: 3 Hrs.	**Marks 20**
Q. 1. Physical Chemistry / Analytical Chemistry experiment	15 Marks
OR	
Inorganic/ Organic Qualitative analysis	
Q. 2. Oral	03 Marks
Q. 3.Attendance and Behaviour	02 Marks
Total:	**20 Marks**

Note: Distribution of Experiments – One fourth of the total students in a batch will be given physical chemistry experiment, one fourth will be given an analytical chemistry experiment and one half of the students will be given an Inorganic / Organic qualitative analysis.