



HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name : **B. Sc. Chemistry** Semester : **II**
PROGRAM CODE : **SCIUG102**
COURSE CODE : **SC23MJDSCCHE201**

Type of course : **Major Discipline Specific course MJDSC**

Name of course : **Fundamentals of chemistry II**

Total Marks : **100**

Effective from June 2023 Under NEP 2020

Total Credits : 04	Teaching Hours per Week: 04	Theory	External 50 Marks
	Teaching Hours per Semester: 60		Internal 50 Marks

Course Objectives:

1. To understand concepts of inorganic chemistry in terms of coordination compounds, p block elements.
2. To apply Stereo chemistry and spatial arrangement of some compounds.
3. To understand Thermodynamics as basis of general laws of sustainable equilibrium.
4. To know about the Volumetric titrations and calculations for estimation various ions.

Course Outcomes:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry.
2. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
3. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
4. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
5. Students will be able to function as a member of an interdisciplinary problem solving team.

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Unit	Topic	Credit	Hr
1	Coordination Compounds DR. NIP Werner's Theory; Explain the structure of Co(III) ammines on the basics of Werner's theory, Experimental evidence in favor of Werner's theory Sidgwick's effective atomic number (EAN) rules, Application of EAN rules, Nomenclature of Coordination compounds. Nature of Metal legend bonding VB theory, Limitation of VB theory. Isomerism in Coordination Compounds, Structural, Conformation, Ionization, Hydrate, Coordination, Linkage, Coordination position, Ligand and Polymerization isomerism. Stereo isomerism, Geometrical isomerism and Optical isomerism.	1	15
2.	Stereochemistry DR. MAP Introduction of Stereo Isomers; (A) Optical isomerism : General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, R-S Nomenclature, Threo and Erythro diastereomers, Meso compounds. (B) Geometrical isomerism : Definition and general discussion of geometric isomers, General Methods of structure determination (physical methods), E-Z nomenclature, (Simple illustration should be given). (C) Conformational isomerism : Definition, Conformational analysis of ethane, n-butane with rotational And tortional diagram, Conformation of cyclohexane, Axial and Equitorial bonds, Newmann projection, Show horse formula, Fisher & flying wedge formula, Difference between conformation and configuration.	1	15
3.	Thermodynamics DR. MRC Thermodynamics (only introduction) : System and surrounding- work & heat, state function, thermodynamic process, internal energy,	1	15

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	enthalpy, free energy, maximum work function. First law of thermodynamics heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship, Work done in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics, Carnot cycle and its efficiency , Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases. Gibbs- Helmholtz equation, Vant hoff isochore equation, Vant hoff isotherm equation, Numerical.		
4.	(A) Introduction To Volumetric Analysis <i>Prof. APK</i> Principle, Mechanism and Applications of Acid-Base Titrations (Only strong acid Vs strong Base), Redox Titrations (Only Fe(II) Vs KMnO_4), Complexometric Titrations (Only $\text{Ca}^{+2}/\text{Mg}^{+2}$ Vs EDTA), Precipitation Titrations (Only Vs AgNO_3), Related Numerical. (B) Complexometric titrations Introduction, EDTA :An important chelating Agents Types of EDTA titration metallochromic indicators, Factors Affecting on stability of complexes, masking and de masking, selectivity of titration construction of the titration curve.	1	15
Books Recommended: Inorganic Chemistry 1. 'Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coiling Educational. 1983. 2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999.. 3. 'Concise Inorganic Chemistry' J.D.Lee. 5th edn. 4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rd edn, Oxferd. 1999. 5. 'Concise Inorganic Chemistry' J.D.Lee, 4th edn, Champman and hall ELBS, 1991. 6. 'Inorganic Chemistry' by A.G.Sharp, 3rd edn, ELBS, Longman, 1990. Organic Chemistry 1. 'Organic reaction and mechanism, P.S.Kalsi, New Age international Publishers.			



2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.
3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.
4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.
- Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5thedn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5th edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.


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Practical- Major



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Program Name : B. Sc. Chemistry Semester : II
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COURSE CODE : SC23PMJDSCCHE201

Type of course : Practicals Major Discipline Specific Course PMJDSC

Name of Course : Practical's for Fundamentals of chemistry II

Total Marks : 100

Effective from June 2023 Under NEP 2020

GROUP A

Total Credits : 02	Teaching Hours per Week: 04	Practicals	External 25 Marks
	Lab Teaching Hours per semester:60		Internal 25 Marks
Minimum number of practicals to be performed: 12			

GROUP B

Total Credits : 02	Teaching Hours per Week: 04	Practicals	External 25Marks
	Lab Teaching Hours per semester:60		Internal 25 Marks
Minimum number of practicals to be performed: 08			

Course Objectives:

1. To identify the cationic and anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals (Any twelve)	Credit	Hr
GROUP A	Inorganic Chemistry Semi micro Analysis: Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 12 compounds.	2	60
GROUP B	Volumetric Titrations (Any Eight) 1. To determine the strength of NaOH and Na ₂ CO ₃ present in	2	60

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	the mixture of NaOH & Na₂CO₃ solution and to find out their percentage composition. 2. To determine the strength of NaHCO₃ and Na₂CO₃ present in the solution mixture of NaHCO₃ & Na₂CO₃ solution and to find out their percentage composition. 3. To determine the Normality, gram/liter and molarities of H₂C₂O₄.2H₂O and H₂SO₄ present in the mixture of H₂C₂O₄.2H₂O and H₂SO₄ solution by using X N NaOH and Y N KMnO₄ solutions. 4. To determine the Normality, gram/liter and molarity of H₂C₂O₄ .2H₂O and K₂C₂O₄ present in the mixture of H₂C₂O₄ .2H₂O & K₂C₂O₄ solution by using X N NaOH and Y N KMnO₄ solutions. 5. To determine the amount of Ca²⁺ and Mg²⁺ ion by EDTA solution from the mixture of CaCl₂ and MgCl₂ solution. 6. Determination of chloride ions in the given solution by titrating against the standardized solution of silver nitrate. 7. To determine the concentration/molarity of KMnO₄ solution by titrating it against Standard solution of ferrous ammonium sulphate. 8. Preparation of standard stock solution of NaOH by W/V method and their different dilutions. 9. Preparation of standard stock solution of K₂Cr₂O₇ by W/V method and their different dilutions. 10. To determine molar mass of unknown acid by titration with NaOH.	
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Books Recommended:

1. Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.
2. Basic Principles of Practical Chemistry, by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012
3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.



By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS,
Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisher Mc Graw Hill, 1st Edition Paperback – 16 September 2020.
2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.


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