



Establishment
27/11/1928

SNJB (Jain Gurukul's)

**K.K.H. Abad Arts, S.M.G. Lodha Commerce & S.P.H. Jain Science College
Neminagar, Chandwad-423101, Dist.-Nashik, Maharashtra**

(Affiliated to Savitribai Phule Pune University) Id. No.PU/NS/AC/015/1970

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DST-FIST Funded (2018-19)

UGC-NSQF Courses (B.Voc. & CC)

Best College Award by Savitribai Phule Pune University (2015-16)

List of Documents: M.Sc. II Analytical Chemistry and B.Voc

Sr. No.	Document Name	Page No.
01	Syllabus Copy: Analytical Chemistry	02-03
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University of Pune
Revised Syllabus
M. Sc.-II Analytical Chemistry
Applicable from 2014-15

Semester-III		
Paper	Sections	Name of Paper
CHA-390	I & II	Electro analytical and Radio analytical methods of analysis
CHA-391	I & II	Pharmaceutical Analysis
CHA-392	I & II	Advanced analytical Techniques
CHA-380	Any Two Sections from following	
	I	Analytical Method development & validation
	II	Geochemical and alloy analysis
	III	Laboratory Automation and Sensor Based Techniques
Semester-IV		
Paper	Sections	Name of Paper
CHA-481	I & II	Analytical Toxicology and Food Analysis
CHA-490	I & II	Analytical spectroscopy
CHA-491	I & II	Analytical methods for analysis of fertilizers, detergents, water and Polymer, Paint and pigment
CHA-492	Method of Analysis and Applications : Any Two Sections from following	
	I	Pollution Monitoring and Control
	II	Analysis of body fluid
	III	Carbon Nanostructures and Applications of Nanotechnology
Practical Courses		
<i>Minimum 20% students must have complete Project work in leave of Practical course III</i>		
CHA-387	<i>Analytical chemistry Practical Course –I</i>	
CHA-487	<i>Analytical Chemistry Practical Course-II</i>	
CHA-488	<i>Analytical Chemistry Practical Course-III</i>	

Industrial Tour and Report writing is compulsory



CHA-387: Practical Course-I: Analysis of materials (6 Credits)

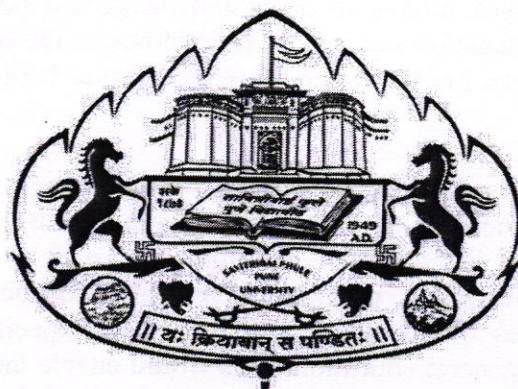
Experiment No	Name of experiment
1	Analysis of Bronze with respect to Copper and Tin
2	Determination of aluminium and magnesium from Magnalium alloy
3	Analysis of Dolomite ore for Ca, Mg and Silicate material
4	Analysis of bauxite ore
5	Analysis of Cement with respect to SiO ₂ , Calcium, Iron, Magnesium and Aluminium
6	Analysis of Zn-Chrome pigment for Cr and Zn
7	Spectrophotometric determination of lead in leaves using dithizone-chelating agent
8	Determination of alcohol from given sample by Spectrophotometrically
9	Determination of Nitrogen from Fertilizer sample
10	Estimation of Iron from syndent
11	Limit Tests: i) Iron from CaCO ₃ ii) Sulphate and Chloride from Paracetamol, Dextrose or any pharmaceutical Preparation
12	Analysis of Salbutal sulphate from asthma inhaler by UV spectrophotometry.
13	Estimation of Cu and Fe(III) by spectrophotometric titration. (Standardization of EDTA is expected).
14	Determination of Phosphate from fertilizer sample by volumetric method.
15	Removal of dyes on activated charcoal by column chromatography
16	Determine amount of magnesium from given talcum powder
17	Determination of COD from waste water
18	Analysis of water with respect to sulphate & Chloride
19	To analyse given sample of Magnalium alloy and determine percentage of aluminium gravimetrically and magnesium complexometrically.
20	Determination of calcium from given sample of plaster of Paris
21	Analysis of nicrome alloy with respect to nickel and chromium
22	Determination of cation exchange capacity of cation exchange resin or anion exchange capacity of anion exchange resin
23	Determination of organic carbon in soil
24	Determination of total cation concentration in waste water sample by cation exchange resin.
25	Analysis of copper ferrite (CuFe ₂ O ₄) and determine amount of copper and iron volumetrically
26	To determine phosphoric acid in cold drink by molybdenum blue method.
27	Determination of Titanium from pigment/raw material

Perform any 22 experiments [11 Experiments per Semester]

Industrial Tour and Report writing is Compulsory



Savitribai Phule Pune University, Pune



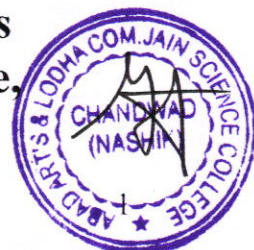
Syllabus for the First Year Bachelor of Vocation (Sem I & II)

**Program: B.Voc.
(UGC Recognized)**

Course Title: “Analytical Techniques in Pharmaceutical Analysis”

(Credit Based Semester and Grading System
with effect from the academic year 2018–2019)

**Members of Board of Studies at KKHA Arts
SMGL Commerce and SPHJ Science College,
Chandwad.**



-: Preamble:-

B.Voc. is introduced with the needs of the economy so as to ensure that the graduates of higher education system have adequate knowledge and skill for employment and entrepreneurship. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while developing a holistic and well groomed graduate.

The University Grants Commission (UGC) has launched a scheme on skill development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma / Advanced Diploma under the NSQF. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles and their NOSs along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

Objectives

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out of 10+2 with vocational subjects.

Levels of Awards

The certification levels will lead to Diploma/Advanced Diploma/B. Voc. Degree in one or more vocational areas and will be offered under the aegis of the University. Award Duration Corresponding NSQF level

- Diploma 1 Year
- Advanced Diploma 2 Years
- B.Voc. Degree 3 Years

Eligibility and Fees for Admission in B.Voc.

The eligibility condition for admission to B.Voc. programme shall be 10+2 or equivalent, in any stream.



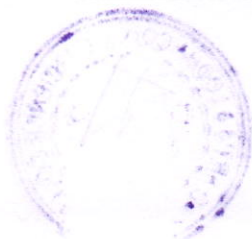
AP-015: Principles of Analytical Chemistry & Chemical Equilibrium

Chapter No.	Section: Skill Components Credit:
1	Errors, Statistics and Sampling Accuracy and precision, Error, types of error, systematic and random errors, minimization of errors, mean and standard deviations, reliability of results, confidence interval, comparison of results, student T test, F test, Comparison of two samples (Paired T test), correlation and regression, correlation coefficient and liner regression, Sampling, the basis of sampling, sampling procedure, sampling statistics.
2	Acid Base Equilibria and Buffer Solutions Acid-base theories, Definition of pH and pH scale (Sorenson and operational definitions), and its significance, Hammett acidity function, pH at elevated temperatures, pH for aqueous solutions of very weak acid and base, pH for salts of weak acid and weak bases, polyprotic acids. Buffer solutions, buffer capacity, applications of buffers, Physiological buffers, buffers for biological and clinical measurements.
3	Mole Concept and Oxidation-reduction Mole concept-Determination of mol. Weight by gram molecular volume relationship, problems based on mole concept. Methods of expressing concentrations, strength, normality, molarity, molality, %w/v, %v/v, ppm, standardization of solutions, primary & secondary standard substances, Preparation of standard solution of acids & bases, problems related to acid base titrations only. Oxidation & reduction-Definitions to related terms like oxidation, reduction, oxidizing agent, reducing agent, oxidation number, Balancing of redox reactions using oxidation number method & ion electron method, problems based one equivalent weight of oxidant & reductants.
4	Introduction to Chemical Equilibrium Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium, Le Chatelier's principle.
	Books Recommended: 1. D. A. Skoog and D. M. West, Fundamental of Analytical Chemistry, 7th Edition (1996), Saunders College Publishing, Philadelphia, Holt, London. 2. R. L. Pecsok, L. D. Shields, T. Cairns and L.C. McWilliam, Modern Methods of Chemical Analysis, (1976), John Wiley & Sons, New York. 3. D. A. Skoog, Principles of Instrumental Analysis, 5th Edition (1998), Saunders College of Publishing, Philadelphia, London. 4. H. A. Strobel, Chemical Instrumentation: A Schematic Approach, 2nd Edition (1973), Addison Wesley, Reading, Mass. 5. Analytical chemistry, G. D. Christian, Sixth Edition, Wiley publications

Ref. 7-10

AP-016: Good Laboratory Practices & Safety in Chemical Laboratories

Chapter No.	Section: Skill Components Credit:
1	Principles of Good Laboratory Practices Definitions, Good Laboratory Practices, Activity, Archive, Personnel, Procedure, *



	Facilities, Personnel, Materials and Reagents, Test and Reference Substances, Standard Operating Procedures, Methods, Instrument & Equipments, Dilutions, Weighing, Mobile Phase Preparation, HPLC & GC Column Care, Calibration & Validation, Statistical tools for Evaluation of Data, Analyst Qualification or Personnel Validation, Qualification of calculators and excel spreadsheet
2	Analytical Method Validation & Verification Preparation of protocol or procedure and report, Perform AMV for various drug substances and drug products, Analytical Method Transfer, Basics of Data Integrity, Basic concept of Data Integrity, Data integrity in paper copy and electronic copy
3	History and importance of safety and health in Laboratory Importance of Safety and security, Responsibility and accounting for safety, Types of hazards and risk in chemical laboratory, Moral legal and financial reasons, Introduction to different types of Hazards
4	Establishing Effective chemical safety and security management Introduction, Responsibility of laboratory safety and security, Ten step to creating an effective laboratory chemical safety and security management safety
5	Personnel protective and other safety equipments Personnel clothing, Foot protection, Eye and face protection, Safety shield, Fire safety equipments, Heat and smoke detector, Respirators, Safety showers, Eye wash unit
6	Chemistry of pharmaceutical industry Definition of drug, qualities of drugs, classification of drugs (functional and chemotherapeutic drugs). Meaning of following terms with one example: - analgesic, antipyretic, diuretics, sulpha drugs, anaesthetics, antibiotics, antacid, antiinflammatory, tranquilisers. Synthesis and use of following drugs :- paracetamol, sulphanilamide, benzocaine, synthetic penicillin Manufacture of aspirin

Ref. 13

AP-017: Laboratory Course-I

Chapter No.	Section: Skill Components Credit:
1	1. Study the hydrolysis of ammonium chloride or sodium acetate or aniline, hydrochloride conductometrically. ✓ 2 General procedure to run the TLC (Thin layer chromatography) ✓ 3. Preparation and standardization of volumetric solutions like 0.1N HCl, 0.1N NaOH, 0.01M Na ₂ S ₂ O ₃ 4. Determination of ferrous ammonium sulfate potentiometrically with standard ceric sulfate solution (Direct and back titration). 5. Determination of concentration of halide ion(s) in the given solution potentiometrically. 6. Determination of concentration of Fe ion in ferric salicylate complex spectrophotometrically. 7. To prepare and standardize 0.1 N HCL using sodium carbonate as a primary standard. 8. To determine sodium carbonate content of washing soda 9 Spectrophotometric determination of pK value of an indicator.



Semester - I

AP-011: General English & Soft Skill

Chapter No.	Section: General Components Credit:
1	Vocabulary Building Analogy, One-Word Substitutes, Words often confused, Synonyms and Antonyms
2	Grammar – 1 Types of Verbs, Subject- Verb Agreement
3	Grammar – 2 Tense (present and past) and Aspect, The several possibilities for denoting future Time
4	Listening Skills The Importance of Listening, Barriers/Obstacles to Effective Listening, Strategies for Effective Listening
5	Reading Skills Skimming, Scanning, Comprehension

Ref. 1-3

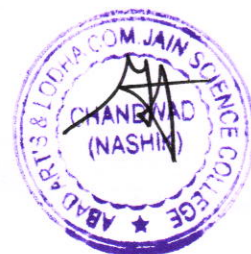
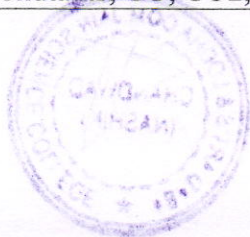
AP-012: Basic Chemical Mathematics

Chapter No.	Section: General Components Credit:
1	Functions and variables Variables as function, variables used in chemistry
2	Derivative Rules of differentiation, examples on derivatives of algebraic, logarithmic and exponential functions, partial differentiation, conditions for maxima and minima, problems related to chemistry,

Ref. 4

AP-013: Environmental Chemical Analysis and Control

Chapter No.	Section: General Components Credit:
1	Sampling in analysis Definition, theory and techniques of sampling, sampling of gas, liquids and solids, Criteria of Good sampling, Minimization of Variables, transmission and storage of samples, high pressure ashing techniques (HPAT), particulate matter, its separation in gas stream, Filtering and gravity separation. Analysis of particulate matter like asbestos, mica, dust and aerosols etc.
2	Environment its characteristics and Classification Metallic and non-metallic pollutants Cr, Hg, Pb, Cd, Cu, As etc. Their physiological manifestation, source, analysis and control of inorganic compounds.
3	Air pollution Chemistry of Air pollutants, Characterization. Source, methods of analysis of air pollutants; CO, CO ₂ , NO _x , NH ₃ , H ₂ S, SO ₂ , etc. Monitoring Instruments, Potable'



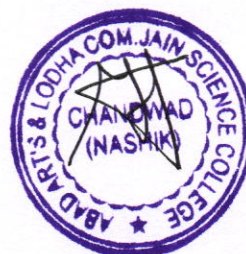
	and Industrial water, major and minor components, dissolved oxygen (DO) Chemical oxygen demand (COD) Biochemical oxygen demand (BOD) and their measurements and significance in waste water treatments, Threshold odor number.
4	Industrial waste Water analysis Quality of Industrial waste Water analysis for organic and Inorganic constituents, Chemistry of odour and its measurements, Radioactive wastes and its control, Sewage and sludge analysis. Treatment, disposal and source of phenolic residue, Analytical methods, treatment by using stream. Gas stripping, ion exchange, solvent extraction, oxidation method and microbiological treatment.
	Books Recommended: 1. A. K. De: Standard Methods of Waste and Waste water analysis. 2. S. M. Khopkar, Environmental Chemistry; Environmental pollution analysis. 3. M. S. Creos and Morr, Environmental Chemical Analysis, American publication(1988) 4. A. K. De, Environmental Chemistry, New Age International publishers.Moghe and 5. Ramteke, Water and waste water analysis : (NEERI) 6. A. C. Stern, Air pollution: Engineering control vol.IV(AP) 7. P. N.Cheremisinoff and R.A.Young, Air Pollution controland Design.Hand Book Vol.I&II (Dekker) 8. R. B.Pohasek, Toxic and Hazardous waste disposal, Vol.I&II (AAS) 9. M. Sitting, Resources Recovery and Recycling, Handbook of industrial Waste. 10. B. K. Sharma, Industrial Chemistry. 11. S. P. Mahajan, Pollution Control in Process Industries. 12. R. A. Horne, Chemistry of our Environment.

Ref. 5-6

AP-014: Electrochemistry

Chapter No.	Section: General Components Credit:
1	Electrochemical Cells Introduction, Types of electrodes, Reversible and irreversible cells, EMF and its measurements, Standard cells, cell reaction and EMF, Single electrode potential and its calculation, Calculation of cell EMF, Thermodynamics of cell EMF, Classification of electrochemical cells with and without transference, Applications of EM F measurement-i) Solubility product of sparingly soluble salt, ii) Determination of pH, iii) Potentiometric titration
2	Electrolytic Conductance Recapitulation of Electrolytic conductance, Specific and equivalent conductance, Variation of equivalent conductance with concentration, Kohlrausch's law and its applications to determine a. Equivalent conductance at infinite dilution of a weak electrolyte, b. The ionic product of water, c. Solubility of sparingly soluble salts, Migration of ions and ionic mobilities, absolute velocity of ions

Ref. 7-8



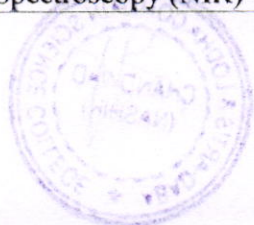
Semester - II

AP-021: Numerical Methods & Computer Programming

Chapter No.	Section: General Components Credit:
1	Introduction to Computer programming concept –internal representation of data - Algorithm and flow chart, Basics of procedure oriented and object oriented programming. Introduction to C++: Structure of C++ program; Keywords; Identifiers; Data types – integer, real, character, string, boolean, enumeration, Constant and Variables; Operators – assignment, arithmetic, relational, logical, increment, decrement and conditional operators; Statements – simple & compound, declaration statements. Input and output streams.
2	Control statements: if, if-else, switch, for, while, do-while, break and continue statements, Arrays – one dimensional & two dimensional; Functions: inline functions, function over loading, Functions with default arguments, recursion.
3	Basics of Pointers. Function call by value, call by reference. Preparation of programs for evaluation of Factorial of a number, infinite series, Sorting, Searching and Matrix multiplication.
4	Introduction to Class and Object- definition, data members, member function. private & public member functions, member access, friend declaration, class objects, predefined classes, initialization. Inheritance- base class and derived class. Simple programs using the above features. (No programming questions for University examination and internals)
5	Errors and approximations, sources of errors. Solution of linear system of equations: Gauss elimination, Gauss-Jordan and Gauss-Seidel methods. Interpolation: Lagrange and Aitken techniques.
6	Curve fitting: method of least squares, non-linear relationships, Linear correlation, measures of correlation. Solution of Partial differential equations: classification, Laplace equation, Finite difference method. Numerical problems and preparation of computer programs for the above methods

AP-022: Basic Analytical Techniques

Chapter No.	Section: Skill Components Credit:
1	UV-Visible Spectroscopy : Brief review of electromagnetic spectrum and absorption of radiations. The chromophore concept, absorption law and limitations. Theory of electronic spectroscopy, absorption by organic molecules. Choice of solvent and solvent effects. Applications of UV - Visible spectroscopy, Woodward-Fisher rule for calculating absorption maximum, interpretation of spectra, Operational Procedure & Calibration.
2	Infrared Spectrophotometry : Introduction, basic principles and sampling techniques, interpretation of spectra, applications in pharmacy, FT-IR, Attenuated Total Reflectance (ATR). Near infra red Spectroscopy (NIR) - theory and applications, Operational Procedure & Calibration.



AP-018: Laboratory Course-II

Chapter No.	Section: Skill Components Credit:
1	1. Determination of moisture content in organic compounds using Karl-Fischer method. 2. To estimation of iron from the given tablet. 3. Fluorometric determination of riboflavin (Vitamin B ₁₂). 4. Determination of normality of given HCl and CuSO ₄ thermometrically 5. To determine amount of Paracetamol in tablet. 6. Estimation of carbohydrates by Anthrone method. 7. Determination of hardness of water from a given sample of water by EDTA method. 8. Determination of Glucose from Glucone -D By titration with Fehling solution. 9. Isolation of caffeine from tea powder.

AP-019: Laboratory Course-III

Chapter No.	Section: Skill Components Credit:
1	Project/ Industrial Training or Visit

References:

- 1) Intermediate English Grammar- Raymond Murphy (Cambridge University Press, 1999)
- 2) Advanced Grammar in Use- Martin Hewings (Cambridge University Press, 2001)
- 3) Longman Dictionary of Common Error-, N. D Turton, J. B Heaton (Pearson, 2004)
- 4) Mathematical preparation of Physical Chemistry by F. Daniel, Mc Graw Hill Publication
- 5) Environmental Chemistry-A.K.De 5th Edⁿ
- 6) Environmental Chemistry-J. W. Moore & E.A. Moore
- 7) Essentials of Physical Chemistry by B.S. Bahl, G.D.Tuli and ArunBahl Edition 2000 S. Chand and Company Ltd
- 8) Principles of Physical Chemistry, Fourth Edition by S.H. Marron and C. F. Pruton
- 9) Basic Concept of Analytical Chemistry-2nd edition S.M. Khopkar
- 10) Analytical Chemistry by Skoog
- 11) Textbook of Quantitative Chemical Analysis- 3rd Edition, A. I. Vogel
- 12) Vogel's textbook of Quantitative Inorganic Analysis-4th edition
- 13) Guidance for Industry – Good Laboratory Practices



AP-023: Basics in Polymer Chemistry

Chapter No.	Section: General Components Credit:
1	Classification of Polymer: Organic and Inorganic Polymers a) Basic concepts, nomenclature, degree of polymerization, classification of polymerization reactions, thermodynamics and transport properties of polymer. b) Nylon, polyesters (terylene and dacron), rubber, vulcanization of rubber, synthetic rubber, Bun 2-N rubber, copolymers of butadiene, PVC, acrylic Teflon, polyethylene and acrylonitrile c) Silicone polymers: silicone oils, rubber, grease and resin d) Resins: Phenol-formaldehyde resins, urea-formaldehyde resins, epoxy resins, melamine-formaldehyde resins.

Ref. 4-5

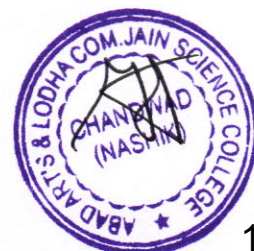
AP-024: Miscellaneous Method of Analysis

Chapter No.	Section: Skill Components Credit:
1	Chromatography Introduction and classification of chromatographic methods, Principle of chromatographic analysis with match box model, Theoretical plates and column efficiency, Theory, Principle, Technique and applications of Column Chromatography, Ion exchange Chromatography, Thin layer Chromatography, Paper Chromatography
2	Refractometry Specific refractivity's of the given liquids A and B and their mixture and hence determine the percentage composition their mixture C, To determine the molecular refractivity of the given liquids A, B, C and D, To determine the molar refraction of homologues methyl, ethyl and propyl alcohol and show the constancy contribution to the molar refraction by -CH ₂ group.
3	Potentiometry To prepare standard 0.2 M Na ₂ HPO ₄ and 0.1 M Citric acid solution, hence prepare four different buffer solutions using them. Determine the pka value of these and unknown solutions, To determine the concentrations of strong acid and weak acid present in the mixture by titrating with strong base, To determine the formal redox potential of Fe ²⁺ / Fe ³⁺ system potentiometrically, To determine the amount of NaCl in the given solution by potentiometric titration against silver nitrate, Case Study – Determination of assay by Potentiometry for Finished Products
4	pH metry To determine the degree of hydrolysis of aniline hydrochloride, To determine pka value of given weak acid by pH-metric titration with strong base, To determine the dissociation constant of oxalic acid by pH-metric titration with strong base, To determine pH of various mixtures of sodium acetate and acetic acid in aqueous solution and hence to find the dissociation of acetic acid.
5	Conductrometry Cell constant of the given cell using 0.01 M KCl solution and hence determine dissociation constant of a given monobasic weak acid, To estimate the amount of



3	Potentiometry, Conductometry and Flurometry. Introduction, Basic Principle, Instrumentation, Operational Procedure and Calibration.
4	pH Meter Introduction, Basic Principle, Instrumentation, Operational Procedure and Calibration.
5	Other chromatographic techniques: Ion-exchange, ion-pair, affinity, size exclusion, chiral and super critical fluid chromatography: Principle, material used, application in the analysis.
6	<p>Analysis of Organic Compounds (Qualitative & Quantitative)</p> <p>I. Qualitative A. Types of organic compounds, Characteristic tests and classifications, reactions of different functional groups, analysis of binary mixtures.</p> <p>II Quantitative B. Analysis—estimation of C, H, (O) by combustion tube, detection of nitrogen, sulfur, halogen and phosphorous by Lassigen's test. C. Estimation of nitrogen by Dumas's Kjeldahl's method, estimation of halogen, sulphur and phosphate by Carious method. D. Determination of empirical and molecular formula, numerical problems</p> <p>Introduction to volumetric analysis Introduction, methods of expressing concentrations, primary and secondary standard solutions. Apparatus used and their calibration: burettes, microburettes, volumetric pipettes, graduated pipettes, volumetric flask, methods of calibration, Instrumental & non instrumental analysis – principles & types</p> <p>Non Instrumental volumetric analysis</p> <p>Indicators—theory of indicators, acid base indicators, mixed and universal indicators [3] Acid–Base titrations: Strong acid–Strong base, Weak acid–strong base, Weak acid–Weak base titration, Displacement titrations, polybasic acid titrations. (Discuss titration with respect to neutralization and equivalence point determination and limitations) [6] Redox titrations: Principle of redox titration, detection of equivalence point using suitable indicators. [3] Complexometric titrations: Principle, EDTA titrations, choice of indicators [6] Iodometry and Iodimetry: Principle, detection of end point, difference between iodometry and iodimetry, Standardization of sodium thiosulphate solution using potassium dichromate and iodine method, Applications – estimation of Cu , estimation of Cl₂.</p>

Ref. 6-12



	<p>lead present in given solution of lead nitrate by conductometric titration with sodium sulphate, To investigate the conductometric titration of any one of the following</p> <p>a) Strong acid against strong base b) Strong acid against weak base c) Strong base against weak acid d) Weak acid against weak base</p>
6	<p>Spectrophotometry/ Colorometry Introduction, Electromagnetic spectrum, Interaction of electromagnetic radiations with the matter, Mathematical Statement and derivation of Lambert's Law and Beer's Law, Terminology involved in spectrophotometric analysis, Instrumentation of single beam colorimeter, Instrumentation of single and double beam spectrophotometer, Principle of additivity of absorbance and simultaneous determination, Spectrophotometric Titrations, Experimental Applications-Structure of organic compound. Concept of λ-max, Lambert-Beers law and concentration of unknown solution of KMnO_4 in 2 N H_2SO_4, Theoretical aspect to recognize λ_{max} and concentration of unknown solution of CuSO_4, Photometric titration viz. (Cu^{2+} ions with EDTA), To determine the indicator constant of methyl red indicator.</p>
7	<p>Atomic Absorption Spectroscopy Introduction and theory of atomic absorption spectroscopy, Instrumentation of single beam atomic absorption, Spectrophotometer Measurement of absorbance of atomic species by AAS, Spectral and Chemical Interferences, Qualitative and Quantitative Applications of AAS</p>
8	<p>Flame Emission Spectroscopy Introduction and theory of atomic emission spectroscopy 10.2 Instrumentation of single beam flame emission spectrophotometer, Measurement of emission of atomic species, Interferences in emission spectroscopy, Methods of analysis- calibration curve method, Standard addition method and internal, standard method, Qualitative and Quantitative Applications of FES</p>

Ref. 6-12

AP-025: Basic Organic Chemistry

Chapter No.	Section: Skill Components Credit:
1	<p>Introduction to Organic Chemistry Development of organic chemistry, unique Properties of organic compounds, Sources of organic compounds, applications of organic compounds. Functional groups and their reaction, preparation, properties & uses</p>
2	<p>Structure & Bonding in organic Molecules Covalent bond, Hybridization in organic molecules (sp^3, sp^2, sp), bond length, bond angles, bond energies, localized & delocalized chemical bond, vander Waal's interactions, Inter & Intra molecular forces & their effects on physical properties, Structural effects like inductive, Resonance, Hyper conjugation, steric effect, Hydrogen bonding.</p>
3	<p>Isomerism in organic compounds Concept of isomerism, type, (Structural chain, position, functional group), Representation of organic, Molecules – Zig- Zag structures, projection formulae –</p>



	(Saw horse (Andiron), Newman, Fisher & Dotted – wedge), Conformational isomerism in alkanes, free rotation about carbon- carbon single bond, conformation of ethane, propane n, butane , relative stability of different conformations, Optical isomers – Isomer number & tetrahedral carbon atom chirality, optical isomerism with one asymmetric carbon atom, Polarimeter, Specific rotation, Enantiomerism R & S Nomenclature, Geometrical isomerism – Definition, conditions for geometrical isomerism, cis-trans & E-Z nomenclature, physical & chemical properties of geometrical isomerism.
4	Introduction to FDA, NPL, ISO 9000, BIS, IPR etc.

Ref. 15

AP-026: Laboratory Course-I

Chapter No.	Section: Skill Components Credit:
1	1. Determination of Hydrochloric acid content in drug substance by titrimetric method. 2. Identification of active drug substance in sample matrix by colorimetric method 3. To determine the chloride content from drinkable water by titrimetric method 5. Hands on UV- Visible spectrometer for Intermediate & Finished Product 6. Demonstration and working of HPLC. 7. Hands on FT-IR Spectrophotometer for drug substance 8. Demonstration and working of HPLC. 9. Determination of Optical rotation using Polarimeter. 10. Autotitrator 11. Find out Loss on drying of sample. 12. Determination of Chromatographic Impurity in multi-component finished product, 13. Determination of % released of active ingredient in drug substance. 14. Determination of disintegration time in enteric coated tablet

AP-027: Laboratory Course-II

Chapter No.	Section: Skill Components Credit:
1	1. Organic qualitative analysis of binary mixture (Minimum four mixture with one liquid-liquid) 2. 3. Graphical representation using Microsoft excel



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AP-028: Laboratory Course-III

Chapter No.	Section: Skill Components Credit:
1	Project /Industrial Training or Visits

References:

1. Intermediate English Grammar- Raymond Murphy (Cambridge University Press, 1999)
2. Advanced Grammar in Use- Martin Hewings (Cambridge University Press, 2001)
3. Longman Dictionary of Common Error-, N. D Turton, J. B Heaton (Pearson, 2004)
4. Polymeric Materials, C. C. Winding and G. D. Hiatt McGraw Hill Book Co. Polymer Science by Gowariker
5. Polymer science, Bill Meyer, F. W. Jr. John Wiley& sons
6. Essentials of Physical Chemistry by B.S. Bahl, G.D.Tuli and ArunBahl Edition 2000 S. Chand and Company Ltd
7. Principles of Physical Chemistry, Fourth Edition by S.H. Marron and C. F. Pruton
8. Basic Concept of Analytical Chemistry-2nd edition S.M. Khopkar
9. Analytical Chemistry by Skoog
10. Textbook of Quantitative Chemical Analysis- 3rd Edition, A. I. Vogel
11. Vogel's textbook of Quantitative Inorganic Analysis-4th edition
12. Instrumental Methods of Chemical Analysis- Chatwal and Anand
13. Lehninger's, Principles of Biochemistry, by Nelson and Cox Macmillan Publisher 4thEdn.
14. Harper's Illustrated Biochemistry, 26th Edition.
15. Basic Organic Chemistry, Jonthan N Clayden, 2nd Edition.



Scheme of Examinations

Theory + Practical Total Marks 800/ Semester

Theory Course: **Per Paper Total 100 Marks**

For Internal Assessment / Paper **25 marks**

One periodical test on class instructions 20 marks

Active participation in class 05 marks

External Assessment **75**

Marks

Practical Course: **Per Practical 50**

Marks

External Assessment **30 marks**

Project/ Internship/ Report Submission **20 marks.**
(during External Assessment Examination)

Note:

1. 30 Lectures/ Sem is equivalent to 2 Lect/week.
2. Practical shall be of 3hr. duration
3. A minimum of four three field excursions(with at least one beyond the limits of Mumbai) for Green house studies are compulsory. Field work of not less than eight hours duration is equivalent to one period per week for a batch of fifteen students.
4. A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal of FYBVoc GHM and the Field Report or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of FYBVoc GHM as per the minimum requirements. In case of loss of journal a candidate must produce a certificate from the Head of the Department/ Institute that the practicals for the academic year were completed by the student. However though such a candidate will be allowed to appear for the practical examination, the marks allotted for the journal will not be granted.



Shri Neminath Jain Brahmacharyashram (Jain Gurukul's)



**KARMVEER KESHAVLALJI HARAKCHANDJI ABAD ARTS,
SHRIMAN MOTILALJI GIRIDHARILALJI LODHA COMMERCE & SHRIMAN P. H. JAIN SCIENCE (SR.)
AND SHRIMAN PEMRAJAJI DALICHANDJI SURANA ARTS, COMMERCE & SCIENCE (JR.) COLLEGE**

NEMINAGAR, CHANDWAD - 423 101 (DIST. NASHIK)

☎ : (02556) Off. 252125 Tele Fax : (02556) 252125
P. O. Box No. 6 E-mail : alccchandwad@yahoo.co.in

Junior College Code No. 13.01.002
Senior College Code No. 088

SNJB

(Affiliated to University of Pune) Id. No. PUN/NS/AC/015/1970
Website : acschandwadcollege.com (NAAC - RE-ACCREDITED - 'B')

Best College Award - 2015-16 of Savitribai Phule Pune University, Pune

Dr. G. H. Jain
Principal

M.Sc., A.D.C.S.A & A, Ph.D.
Member - B.O.S. (Physics) University of Pune

Outward No. : 19/ALJC/2019-20

Date : 13/04/2019

To,

**Administrative Officer,
SNJB's Jain Gurukul
Chandwad, Nashik**

इनवर्ड नंबर: 15 दिनांक: 15.4.19
स्वाक्षरी : शैला :
प्रशासकीय अधिकारी कार्यालय,
एसएनजेबी, नेमिनगर, चांदवड, जि.नाशिक

Subject: Industrial Visit at Megafine Ltd. Nashik

Respected Sir,

We are happy to inform you that our Department of Chemistry runs Bachelor of Vocation course in "Analytical Techniques in Pharmaceutical Analysis" and we wish to organize Industrial visit at Megafine Ltd. Nashik. Consequently, we have also communicated with the company and they also released permission for visit. To strengthen theoretical & practical knowledge of students, this visit will be milestone for their career. Approximately (20) students and four (04) faculty members will be the part of this visit. (Among the twenty students; 08 students from M.Sc. Analytical Chemistry & ten-twelve students from B.Voc wish to visit). With this context we request you to permit for aforesaid.

We hope for positive response.

Thanking You!

Head
Department of Chemistry

Nodal officer

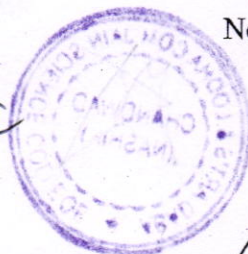
for Dr. G. H. Jain

PRINCIPAL

K.K.H.A. Arts, S.M.G.L. Comm.
& S.P.H.J. Science (Senior) & S.P.D.S
Arts, Comm. (Junior) College,
Chandwad, Dist. Nashik-423101

Received

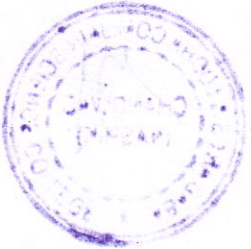
Dr. R. S. Sancheti



P.T.O. →

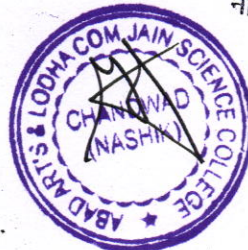
R/Principal

- 1) Ensure Sr.Staff accompanies.
- 2) Adequate numbers of Gents & Ladies staff must accompany.
- 3) Do not take students near water or on hill tops.
- 4) Staff and Students must be in their college uniforms with identity cards.
- 5) State Transportation buses to be hired for tour.
- 6) One Medical Officer should accompany.
- 7) Written permission from the concerned competent authorities must be obtained.
- 8) Strict discipline to be observed.
- 9) Written consent of parents needs to be obtained.
- 10) Ensure that parents are called at the terminal point for taking their children after the tour gets over.
- 11) Necessary rules procedures stipulated from time to time by the competent authorities must be followed.
- 12) If travel is by train in that case do not allow students to get down on railway stations, to avoid mishaps, e.g. boarding the trains while it has already began etc.



P. Lauker

प्रशासकीय अधिकारी
श्री नेमिनाथ जैन ब्रह्मचर्याश्रम (जैन)
नेमिनगर, चांदवड-423 101. जि.



Date - 15/04/19

To,
Principal,
KKHA Arts, SMGL Commerce
& SPHJ Science College, Chandwad

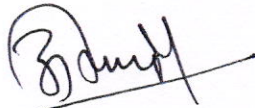
Subject: Industrial Visit at Megafine Ltd. Lakhmapur, Tal. Dindori, Dist. Nashik.

Respected Sir,

We are happy to inform you that our Department of Chemistry runs Bachelor of Vocation course in "Analytical Techniques in Pharmaceutical Analysis" and we wish to organize Industrial visit at Megafine Ltd. Lakhmapur, Tal. Dindori, Dist. Nashik. Consequently, we have communicated with the company and they also released permission for the visit. To strengthen theoretical & practical knowledge of students, this visit will be milestone for their career. Approximately (20) students and four (04) faculty members will be the part of this visit. (Among the twenty students; 08 students from M.Sc. Analytical Chemistry & ten-twelve students from B.Voc wish to visit.) With this context we request you to permit for aforesaid.

We hope for positive response.

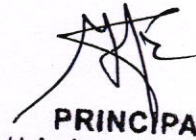
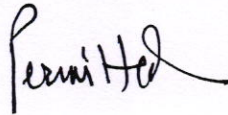
Thanking You!



Head
Department of Chemistry


IQAC

Nodal officer



PRINCIPAL
K.K.H.A. Arts, S.M.G.L. Comm
& S.P.H.J. Science College,
Chandwad, Dist. Nashik-423101



M.Sc. Analytical + B.Voc
16 of = 23

Shri Neminath Jain Brahmacharyashram (Jain Gurukul's)
KKHA Arts, SMGL Commerce and SPHJ Science College
Neminagar, Chandwad-423101, Dist-Nashik, Maharashtra

Students List for industrial Visit-16/04/2019

Sr.No.	Students Name	Mobile No.
1	Miss. Kasav Jagruti.R	9075871278
2	Miss. Ganguarde Dimple	9390325437
3	Miss. Darekar pooja B.	9657178755
4	Miss. Bhadane Roshani	7385398956
5	Miss.Thakare Pallavi	8830705351
6	Mr.Pawar Dattatray D.	7758844110
7	Mr.PawarRoshan	8605092590
8	Miss.Thakare Monali.D	7218501045
9	Miss.Hire Chetna	9588442825
10	Miss.Deore Priyanka	9158557468
11	Miss.Pagar Sadhana	8308359607
12	Mr.Gavali Amol	7875226681
13	Mr.Sonavane sarvesh	8623854142
14	Mr.Omkar kulkarni	8483906629
15	Mr.Alai Pankaj	9766626101
16	Miss.Aishvarya Jagtap	9730442411
17	Mr.Pagar Vishal	8888661628
18	Mr.Mali Sagar	8329289227
19	Miss.Deore Nikita	9561465450
20	Miss Sawant sandhya	9623787320
21	Mr.Gavali Amol	7875226681
22	Sonar Pragati .Y	7028056090
23	Khairnar akshada .S	9423620726

Staff Member

1	Dr.Rakesh.S.Sancheti	9404813036
2	Mr.Prasad.patil	9850982232
3	Miss.Sonali.R.Bothe	9168897209
4	Mr.Sagar.S.Shinde	9527855199
5	Mr.Sunil Chaudhari	9404984408



PRINCIPAL
KKHA Arts, S.M.G.L.Comm.
& S.P.H.J. Science (Senior) & S.P.D.S
Arts, Comm. (Junior) College,
Chandwad, Dist. Nashik-423101

SNJB (Jain Gurukul's)
K.K.H. Abad Arts, S.M.G. Lodha Commerce & S.P.H. Jain Science College
Neminagar, Chandwad-423101, Dist.-Nashik, Maharashtra.
Affiliated to Savitribai Phule Pune University
Bachelor of Vocation (B.Voc.) (Analytical Techniques in Pharmaceutical Analysis)
Department Of Chemistry

Date-16/04/2019

INDUSTRIAL VISIT TO MEGAFINE PHARMA.PVT.LTD

Industrial Visit for Msc II (Analytical & Organic) were organized on **16th April 2019** to the 'Mega fine

During the visit students learned about

IBR Boiler House (Agriculture fuel is used for fuel in Boiler), Waste Water Treatment Plant, SRD (Solvent Recovery Plant), Production Block k, OCP (Occupational Health centre) Intermediate Storage area, Chilling Plant, Used of Scrubber for hazardous Chemical, Static Charge Dissipateter, Liquid Waste Storage Area, Production Block B, C, D & f, API Formation Q.A, Q.C. R.&D Work.

Students observed Working of Analytical instruments like Gas Chromatography, HPLC, and Sensor Balance

There are **16 students and 4 faculty members** participated



SNJB (Jain Gurukul's)
K.K.H. Abad Arts, S.M.G. Lodha Commerce & S.P.H. Jain Science College
Neminagar, Chandwad -423101, Dist.-Nashik, Maharashtra.
Affiliated to Savitribai Phule Pune University
Bachelor of Vocation (B.Voc.) (Analytical Techniques in Pharmaceutical Analysis)
Department Of Chemistry

Date-16/04/2019

INDUSTRIAL VISIT TO MEGAFINE PHARMA.PVT.LTD

Industrial Visit for B.Voc.(Analytical Techniques in Pharmaceutical Analysis) were organized on **16th April 2019** to the '**Mega fine** During the visit students learned about

IBR Boiler House (Agriculture fuel is used for fuel in Boiler), Waste Water Treatment Plant, SRD (Solvent Recovery Plant), Production Block k, OCP(Occupational Health centre)Intermediate Storage area, Chilling Plant, Used of Scrubber for hazardous Chemical, Static Charge Dissipateter ,Liquid Waste Storage Area ,Production Block B, C, D &f , API Formation Q.A, Q.C. R.&D Work.

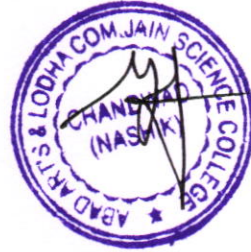
Students observed Working of Analytical instruments like Gas Chromatography, HPLC, Sensor Balance. There are **07 students and 4 faculty members** participated





B. Voc

B. Voc





M.Sc + B.Voc.
Analytical
chemistry





M.Sc. II
Analytical
chem.

Program: Bachelor of Vocation
Course: 'Analytical Techniques in Pharmaceutical Analysis'
Annual Report-2018-2019

It is our great pleasure to convey that from this academic year UGC has sanctioned B. Voc. Course in 'Analytical Techniques in Pharmaceutical Analysis' under NSQF (National Skill Qualification Framework) guidelines. Total Seventeen students were admitted to this course. Subsequently two regular teaching faculty members and one laboratory attendant were recruited. Along with this adequate infrastructure was made available by the Institute in the Department of Chemistry for smooth working of this course. Recently this course is approved by Savitribai Phule Pune University, Pune. We arranged industrial visit at **Megafine Pharmaceutical Pvt. Ltd, Dindori, Nashik** on 28th March, 2019. Dr. Arvind Patil, Dr. Rakesh Sancheti, Dr. Valmik Aware, Mrs. Minakshee Tadarwal, Mr. Sanjay Khairnar, Dr. Dipak Patil, Miss. Swapna Kapadi, Miss. Nutan Magar, Miss. Sonali Nikam, Mr. A. A. Vakil, Mr. Kishor Ahire and Mr. Sunil Chaudhari were also contributed in syllabus completion.

Faculty Profile:

Sr. No.	Name of Faculty Member	Designation	Qualification
1	Dr. Manoj T. Patil	Nodal Officer	M. Sc., Ph. D
2	Dr. Arvind M. Patil	HOD, Chemistry	M. Sc., Ph. D
3	Dr. Rakesh S. Sancheti	Coordinator	M. Sc., Ph. D
4	Dr. Valmik S. Aware	Coordinator	M. Sc., SET, Ph. D
5	Miss. Sonali R. Bothe	Assistant Professor	M.Sc.
6	Mr. Sagar Shinde	Assistant Professor	M. Sc., NET
7	Mr. Prasad Patil	Industry Expert	M.Sc.
8	Mr. Kiran Nikam	Lab. Attendant	

Salient Features:

- ✓ Skill oriented syllabus which functions as a bridge between Industry & Academics.
- ✓ Sanctioned & approved by University Grant Commission, New Delhi & Savitribai Phule, Pune University, Pune
- ✓ Qualified staff members.
- ✓ Sophisticated laboratory facility.
- ✓ Guest lecture of Industry experts & visiting faculties.
- ✓ Visits at Pharmaceutical Industries.



We are thankful to Honorable Members of Management and Principal of the College for providing necessary facilities & extending cooperation.

Industrial Visit:



Photo: Students of B. Voc. (Analytical Techniques in Pharmaceutical Analysis) with Dr. Rakesh Sancheti, Mr. Prasad Patil (Visiting faculty), Miss. Sonali Bothe & Mr. Sagar Shinde visited at Megafine Ltd. Dindori, Nashik.

Team

B. Voc., Analytical Techniques in Pharmaceutical Analysis.

