



The Kelkar Education Trust's
Vinayak Ganesh Vaze College of Arts, Science & Commerce

AUTONOMOUS

Mithagar Road, Mulund East, Mumbai-400081, India

College with Potential for Excellence

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Syllabus for T.Y. B. Sc. Program

Applied Component

Course: HEAVY & FINE CHEMICALS

(Choice Based Credit & Semester System)

(June 2020 Onwards)

Submitted by

Department of Chemistry

Vinayak Ganesh Vaze College of Arts, Science and Commerce

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Learning/Course Objectives:

1. To provide the learner a foundation for understanding of both basic and applied Chemistry.
2. It gives the learner a bridge between Industrial Chemistry and Pure Chemistry.
3. This course helps to develop a strong thinking process amongst the learners both in technical and applied chemistry which will prepare them for employment and advanced study.
4. After completing the course, the learners will be able to provide skills in developing new industrial techniques.
5. The learners will be able to compute the techniques and skills for entrepreneurship.
6. On completion of this course, the learners will be able to identify and evaluate the current techniques and practical knowledge and assess their applicability.

Learning Outcomes:

- On the basis of the syllabi, the learner will be able to
- Explain the very basics of small scale industry right from its setting to the various operations and processes used in different chemical manufacturing processes.
 - Differentiate between heavy and fine chemicals and state their various applications in industry and daily life.
 - Describe the working of various types of pumps
 - Explore the process of manufacture of fertilizers, agrochemicals, glass, perfumes, oils, fats, soaps, flavours, sweeteners, detergents, dyes, drugs
 - Demonstrate the process of preparation of solutions and adapt a method of the planning and implementation of organic and inorganic reactions.
 - Develop skills of various laboratory techniques such as reflux, distillation, recrystallization, vacuum filtration, and thin-layer chromatography.
 - Design a process and analyze the results of chemical reactions.
 - Evaluate and clearly communicate the results of scientific experiments and determine the purity and the yield of the products obtained in the reaction
 - Summarize the findings of the experiment by writing in a clear and concise manner in the form of oral reports, technical graphics, and written reports.
 - Recognize the central role that chemistry plays in our society and daily life
 - Outline the safe handling of chemicals and environmental issues for the betterment of mankind.

T. Y. B. Sc. CHEMISTRY (Six Units) : Choice Based Credit System				
Semester V				
PAPER : Applied Component (Heavy & Fine Chemicals)				
Course Name: Heavy & Fine Chemicals (60 lectures)		Course Code SHFC501		
Periods per week (1 period 50 minutes)		03		
Credits		02		
Evaluation System		Hours	Marks	
		Theory Examination	2.0	60
		Theory Internal		40
			No. of lectures	
Unit I	1.1 Introduction to Chemical Industry. Explanation of the terms Heavy (Bulk) and Fine (Speciality) Chemicals.		03	
	1.2 Silicates: a) Introduction to silicates: Properties, structure and types of silicates. Preparation of sodium silicate.		04	
	1.3 Manufacture and applications of the following: - a) Talcum powder b) Nitric acid c) Sodium dichromate d) Chromium trioxide		08	
Unit II	2.1 Pumps for chemical work a) Introduction of pumps: Pumping equipments for liquids - piston pump, diaphragm pump, gear pump, Centrifugal pumps and submersible pumps. b) Vacuum systems oil sealed pumps, ejectors.		07	
	2.2 Fertilizers: Preparation, properties and uses of a) Normal superphosphate b) Triple Superphosphate c) Ammonium nitrate d) Ammonium Sulphate		04	
	2.2 Fertilizers: Preparation, properties and uses of a) Normal superphosphate b) Triple Superphosphate c) Ammonium nitrate d) Ammonium Sulphate		04	
Unit III	3.1 Brief idea about the economic aspects of chemical manufacturing processes with respect to Location, Raw materials, Energy, Capital, Manpower, Ecological aspects, Tax benefits. Writing a Project Report for setting up an Industry		06	
	3.2 Brief account of perfumes, flavours and sweeteners: a) Perfumes: Introduction, classification (ethers, esters and essential oils) Composition, formation, blending and applications. Synthesis of α and β - ionone's from citral .		03	

	<p>b) Flavours: Introduction, Classification (natural and synthetic), applications of Vanillin, Coumarin (structures), Synthesis of Vanillin.</p> <p>c) Sweeteners: Introduction, classification with examples and structures of</p> <p>A) Natural sweeteners: Carbohydrates (Glucose, Fructose)</p> <p>B) Synthetic sweeteners: i) Sucralose, ii) Sulphonamide: eg Saccharin, iii) Peptides: Aspartame, Synthesis of Saccharin</p>	<p>03</p> <p>03</p>
Unit IV	<p>4.1: Industrial solvents Manufacture and uses of ethyl acetate, isopropyl alcohol, Acetone, Acetic acid, Dimethyl formamide, Brief idea of green solvents.</p> <p>4.2 : Introduction to drugs: Terminology, Classification with one example each. Synthesis and uses of the following : 1) Ethambutol 2) Mebendazole 3) Benadryl 4) Ibuprofen 5) Miconidazole 6) Diazepam</p> <p>4.3: Fluoroaromatics: Introduction, important reagents used for fluorination, Halereaction, Super Halereaction, Preparation of ortho-fluorotoluene and 3-chloro-4-fluoro anilines.</p>	<p>06</p> <p>06</p> <p>03</p>

PRACTICALS

SEMESTER V

APPLIED COMPONENT (HFC)

COURSE CODE: SHFC501

CREDITS: 02

Preparations: (Micro scale)

1. Preparation of Ferrous sulphate heptahydrate
2. Preparation of Aspirin
3. Green synthesis of benzilic acid from benzil

Estimations

- 1) Estimation of tincture iodine.
 - 2) Estimation of methyl salicylate. (Back titration method)
 - 3) Estimation of acetic acid in a sample of vinegar (Titrimetry)
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T. Y. B. Sc. CHEMISTRY (Six Units) : Choice Based Credit System			
Semester VI			
PAPER : Applied Component (Heavy & Fine Chemicals)			
Course Name: Heavy & Fine Chemicals (60 lectures)		Course Code SHFC601	
Periods per week (1 period 50 minutes)		03	
Credits		02	
Evaluation System		Hours	Marks
	Theory Examination	2.0	60
	Theory Internal		40
			No. of lectures
Unit I	<p>1.1 Refrigeration: System, media used for cold transfer (i.e. brine and other)</p> <p>1.2 Different Sources of Energy: Generation, Treatment of boiler feed water, Properties of steam, steam table</p> <p>Glass: Composition, types and applications.</p> <p>1.3 Manufacturing process properties and applications of :</p> <p>a) Sulphuric acid (Contact Process)</p> <p>b) Ammonia (Haber's process)</p> <p>c) Sodium hydroxide</p> <p>d) Hydrochloric acid</p>		<p>03</p> <p>03</p> <p>03</p> <p>06</p>
Unit II	<p>2.1 Zeolites, Clays and Ion-exchange resins</p> <p>2.2 Design of vessel : Classification of chemical reactors, pressure vessels for internal or external pressure, Maintenance, storage vessels for liquids and gases</p> <p>2.3 Manufacture and uses of Industrial gases : Hydrogen and Acetylene</p> <p>2.4 Industrial preparation of Inorganic Fine chemicals: KMnO₄, FeSO₄.10H₂O</p> <p>2.5 Composite materials: Introduction, Constitution of composites, Classification of composites, Particle Reinforced composites, Fiber reinforced composites, Structural composites or Layered composites, Applications of composite materials.</p>		<p>03</p> <p>04</p> <p>02</p> <p>02</p> <p>04</p>
Unit III	<p>3.1 Small Scale Industries and R and D technology: Need and scope of small scale industry, SSI rules and regulations R and D, technology transfer, Role of R and D, Functional structure of R and D unit, Research strategies and manufacturing interface, University-Industry interface, Patents</p> <p>3.2 Manufacture of soaps: Raw materials, Preparation, properties and types of soaps, Continuous process for the manufacture of soap.</p> <p>3.3 Oils and Fats: Introduction, Classification, Properties of oils and fats, extraction of oils from oil seeds, hydraulic pressing and solvent extraction, extraction of animal fats, hardening of oils</p>		<p>07</p> <p>02</p> <p>04</p>

Recommended Books

1. C. D. Dryden: Outlines of Chemical Technology, edited & revised by M. Gopala Rao & Marshall Sittig East West Press, New Delhi.
2. Faith Keyes and Clerk's Industrial Chemicals, 4th Edn., Wiley Inter-science 1975.
3. Foust A. S. et-al.: Principles of Unit Operations John Wiley & Sons.
4. Macabe W.L., Smith J. C. and Harriott. P. Unit Operations of Chemical Engineering (7th edition) (McGraw Hill Chemical Engineering series).
5. P. H. Groggins: Unit Processes in Organic Synthesis, McGraw Hill.
6. Kirk & Othmer: Encyclopaedia of Chemical Technology, John Wiley and sons.
7. A. I. Vogel: Text book of Quantitative Analysis including Instrumental Analysis.
8. A. I. Vogel: Text book of Quantitative Organic Analysis.
9. Industrial Inorganic Chemistry-Buchner, Schliebs, Winter, translated by D. H. Tenell, VCH Publishers, New York.
10. Industrial Organic Chemistry- K. Welssermel, H. J. Arpe, VCH Publishers, New York.
11. B.Pearson- Speciality Chemical Innovations in Industrial Synthesis.
12. Text Book of Organic Medicinal and Pharmaceutical Chemistry Wilson & Giswold
13. Text Book of Pharmacology – Satoskar & Bhandarkar.
14. The Chemistry of Synthetic Dyes – Edited by K. Venkatraman. Academic press Inc. London.
15. Shreeves 'Chemical Process Industries' 5th Edition, G. T. Oustin, McGraw Hill.
16. Industrial Chemistry- B. K. Sharma, Goyal publishing house, Mirut.
17. Riegel's Hand Book of Industrial Chemistry, 9th Edition, Jems A. Kent.
18. Industrial Chemistry- E Stoch, Vol- I, Ellis Horwood Ltd. UK.
19. An Introduction to Industrial Organic Chemistry- Wiseman and Peter, ""
20. Unit Operations and Processes- P. H. Groggins.
21. Unit Operations I and II- P.P. Kale- Pune Vidyarthigruh Prakashan.
22. Unit Operations in Chemical Engineering by W. L. McCabe and Smith.
23. Riegel's Handbook of Industrial Chemistry, J. A. Kent, CBS Publishers, New Delhi
24. Riegel's Handbook of Industrial Chemistry, James A. Kent, 7th Edition, Van Nostrand Reinhold Company.
25. Shreeves 'Chemical Process Industries' 5th Edition, G. T. Austin, McGraw Hill, 1984.

