

Department of Chemistry
Kumaun University, Nainital

Skill Enhancement/Vocational Courses

Course Title: Basics of Analytical Chemistry-I

Programme/Class: Certificate	Year: First	Semester: I
Paper-I Skill Development in Chemical Analysis		
Course Code:	Course Title: Basics of Analytical Chemistry-I	

Course Outcomes: The purpose of the course is to develop skill about basic information about chemistry lab, lab apparatus, solution making and physicochemical principles used in chemistry laboratory work.

Credits: 3	Skill Enhancement
Max. Marks: 25+75	Min. Passing Marks:

Total Number of Hours= 45

Unit	Contents	Number of hours
1	Introduction: Chemistry Laboratory General introduction to chemistry lab, safety rules and precautions in chemistry laboratories, storage, ventilation, lighting, fumes, cupboard, hazards, precautions, maintenance of laboratory, definition of equipment/ apparatus, cleaning of laboratories, apparatus and preparation room.	06
2	Lab Apparatus (A) Glass apparatus Beaker, test tube, boiling tube, conical flask, filtration flask, round bottom flask, flat bottom flask, funnel, separating funnel, watch glass, measuring cylinder, petridish, desiccator, measuring cylinder, glass rod, glass tube. (B) Volumetric and Heating apparatus Volumetric apparatus: Volumetric flask, burette, pipette, analytical balance, electronic balance. Heating apparatus: Bunsen burner, water bath, sand bath, hot air oven, heating mantle (C) Miscellaneous Apparatus Buchner funnel, burner, test tube stand, tong, burette stand, clamp, china dish, wire gauze, cork, vacuum pumps, crucibles, clay pipe triangle, pestle and mortar, spatulas, thermometer, pH meter, Kipp's apparatus.	18
3	Laboratory Reagents and Solvents Reagents: Classification of reagents according to their action: (i) acids (ii) bases (iii) salts (iv) complexing agents (v) oxidizing and reducing agents (vi) precipitating agents (vii) chelating agents. Each	07





	type to be explained with at least one suitable example. Primary and secondary standards: Definition, characteristics, uses examples for different types of reactions. Solvents: Solute, Solvent & Solution, classification of solvents (i) Protic and aprotic (ii) Acidic, basic amphiprotic and neutral (iii) Aqueous and non-aqueous (iv) Polar and nonpolar. Each type is to be explained with at least one example.	
4	Solution Preparation Solutions, components of a solution, types of solution, solubility, concentration terms - percentage, ppm, ppb, g/L, molarity, normality, molality, calculation of masses and volumes for preparation of solutions and their practical approach.	07
5	Physicochemical Principles used in Chemistry Laboratory Ostwald dilution law, common ion effect, solubility product, precipitate, residue, precipitation, Le Chatelier's principle.	07

Recommended Texts:

1. Tatchell, A.R. Vogel's Textbook of Practical Organic Chemistry. Fifth Eds. John Wiley, New York, 1989.
2. Willard, Hobert H., Merritt Jr, L.L., Dean, J., Settoe Jr. F.A. . Instrumental Methods of Analysis. Seventh Eds. Wardsworth Publishing Company, Belmont, California, USA, 1988.
3. Christian, Gary D. Analytical Chemistry. Sixth Eds. New York- John Willy, 2004.
4. Harris, Daniel C. Quantitative Chemical Analysis. Third Eds, W.H. Freeman and Company, New York, 2001.
5. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009.
6. Skoog, D.A., Holler, D.M.W. Fundamentals of Analytical Chemistry. Sixth Eds. Saunders College Publishing, New York, 1992.

Suggestive digital Platforms web links:

1. <http://chemcollective.org/vlabs>
2. <https://www.vlab.co.in/broad-area-chemical-sciences>
3. <https://wp.labster.com/chemistry-virtual-labs/>

Suggested Continuous Evaluation Methods: Students can be evaluated on the basis of score obtained in a mid-term exam, together with the performance of other activities which can include short exams, in class or on-line tests, home assignment, group discussions or oral presentations.

Evaluation method	Marks
mid-term exam / in class or on-line tests / home assignment / group discussions / oral presentations	15 Marks
Overall performance throughout the semester, Discipline, participation in different activities	05 Marks
Attendance	05 Marks

Course Prerequisites: To study this course, a student must be enrolled in B. Sc./B.Com./B.A. II semester.

Suggested equivalent online courses:

Further Suggestions:

Course Title: Basics of Analytical Chemistry-II

Programme/Class: Certificate	Year: First	Semester: II
Paper-II		
Course Code:	Course Title: Basics of Analytical Chemistry-II	

Course Outcomes: the purpose of the course is to develop skill about sample handling, food analysis, quantitative analysis, physical properties, separation and purification techniques.

Credits: 3	Skill Enhancement
Max. Marks: 25+75	Min. Passing Marks:

Total Number of Hours= 45

Unit	Contents	Number of hours
1	Chemical Analysis Definition, collection of samples, selection of appropriate analytical method, preparation of the sample, analysing the sample using your selected method, technique, interpreting the results, report preparation.	09
2	Food Preservation Techniques Food preservation, techniques of food preservation, chemical and physical methods, food preservatives and food packing.	09
3	Quantitative Analysis Titration- Definition and difference between qualitative and quantitative analysis, types of titrations, end point, equivalence point, Indicators-types, oxidizing and reducing agents, gravimetric analysis-detailed description of the steps of gravimetric analysis, applications.	10
4	Physical Properties of Liquids Physical states of matter, melting point, determination of melting point, decomposition, evaporation, sublimation. boiling point, determination of boiling point.	08
5	Separation and Purification Techniques Characterization, uses and selection of separation process, filtration techniques, filter paper, simple filtration, filtration through vacuum pump, distillation- types of distillation, simple distillation, fractional distillation, difference between simple and fractional distillation.	10

Recommended Texts:

- Ditts, R.V. Analytical Chemistry – Methods of Separation, Van Nostrand, New York, 1974.
- Williamson, K.L., Heath, D.C. Macroascale and Microscale Organic Experiments. Seventh Eds. Brooks/Cole, USA, 2016.
- Middleton, H. Systematic Qualitative Organic Analysis. First Eds. Edward Arnold, 1939.
- Clark, H. C. Handbook of Organic Analysis: Qualitative and Quantitative. Adward Arnold, 1947.
- Tatchell, A.R. Vogel's Textbook of Practical Organic Chemistry. Fifth Eds. John Wiley, New York, 1989.
- James, A.M., Prichard, F.E. Practical Physical Chemistry. Third Eds. Longman, New York, 1974.

8. Levitt, B.P. Findley's. Practical Physical Chemistry. Ninth Eds. Longman, New York, 1973.
9. Das, R.C., Behera, B. Experimental Physical Chemistry. Tata McGraw Hill. 1983.
10. Rakestraw, N.W. Experimental Inorganic Chemistry: A Guide to Laboratory Practice. ACS Publications, 1955.

Suggestive digital Platforms web links:

1. <http://chemcollective.org/vlabs>
2. <https://www.vlab.co.in/broad-area-chemical-sciences>
3. <https://wp.labster.com/chemistry-virtual-labs/>
4. <https://ia803001.us.archive.org/25/items/macroscaleandmicroscaleorganicexperiments/Macroscale%20and%20Microscale%20Organic%20Experiments.pdf>
5. https://faculty.ksu.edu.sa/sites/default/files/vogel_-_practical_organic_chemistry_5th_edition.pdf
6. <https://ia800502.us.archive.org/13/items/ost-chemistry-levitt-findlayspracticalphysicalchemistry/Levitt-FindlaysPracticalPhysicalChemistry.pdf>

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Evaluation method	Marks
Mid-term exam / in class or on-line tests / home assignment / group discussions / oral presentations	15 Marks
Overall performance throughout the semester, Discipline, participation in different activities	05 Marks
Attendance	05 Marks

Course Prerequisites: To study this course, a student must be enrolled in B. Sc./B.Com./B.A. II semester.

Suggested equivalent online courses:

1. https://onlinecourses.swayam2.ac.in/cec23_cy04/preview

Further Suggestions:

Course Title: Essential Oils for Wellness

Programme/Class: Certificate	Year: Second	Semester: III
Paper-III		
Course Code:	Course Title: Essential Oils for Wellness	

Course Outcomes: Uttarakhand has been blessed with the unique climatic conditions which make it the perfect hub for essential oil-bearing plants. Our department boasts of the exhaustive research in the field of phytochemistry and essential oils. With increasing awareness, the majority of people are going for organic and natural sources of essential oils and other sensory-pleasing materials like sweeteners. The government is coming forward to support the entrepreneurs financially and technically. This course will enhance the knowledge of the students about the chemical compositions and sources of essential oils with reference to Uttarakhand and it will give them the technical knowledge needed for the extraction of natural oils from the plant species. The course will also enlighten the students about the Government schemes in the relevant field. The course will produce employable students who can be taken readily in the relevant industry of essential oils.

Credits:3	Skill Enhancement
Max. Marks: 25+75	Min Passing Marks:.....

Total Number of Hours = 45

Unit	Contents	Number of Hours
1	Essential Oils: Definition of essential oils, history of extraction of essential oils, traditional uses, sources of essential oils with reference to Uttarakhand. Fixatives: Introduction, sources, classification, chemical composition	05
2.	Composition of Essential Oils: Compounds present in essential oils, Structure of the components of essential oils, physical and chemical properties of the components.	10
3.	Extraction of Essential Oils: Methods of extractions: Maceration, steam distillation, hydrodistillation, solvent extraction, extraction with CO ₂ , microwave extraction. Details of assembly for each method and limitations of the methods.	10
4.	Quality and Safety of Essential Oils: Quality parameters, factors affecting the quality viz. environmental factors, shelf life, plant growth stages, post-harvesting techniques, packing, absolutes, hydrosols, and Carrier media. Hazards associated with essential oils.	10
5.	Aromatic and Medicinal Plants of Uttarakhand and Their Applications: Aromatherapy, Oil composition, applications of essential oils of Haldi, Adrak, Tulsi, Dalchini, Pudina, lemon grass. Government schemes to promote the cultivation of aromatic and medicinal plants, technical centers for extraction.	10

Recommended Texts:

1. Bhat, Sujata, Nagasampagi, V. B.A. Meenakshi, S. Natural Product Chemistry and Applications, Alpha Science, 2020.

2. Guenther, Earnest. The Essential Oils. vol. I Robert E. Kreiger Publishing Co. Huntington, New York, 1972.
3. Bedoukian, Paul Z. Perfumery and Flavouring Synthetics. II Edn, Elsevier Publishing Co., Amsterdam, London, New York, 1967.
4. IBillot, Mareel, Wells, F.V. Perfumery Technology. Ellis Harwood Ltd., Halrted Press, a Division of John Wiley & Sons., Inc. New York, London, 1975.
5. Panda, H. Perfumes and Flavours Technology Handbook, Asia Pacific Business Press Inc., Delhi, 2010.

Suggestive digital platforms web links:

1. <https://iisdt.in/product/diploma-in-aroma-therapy/>
2. <https://perfumeclases.com/wp->
3. <https://www.tutorialsduniya.com/notes/chemistry-of-cosmetics-perfumes-notes>
4. <https://www.tutorialsduniya.com/notes/chemistry-of-cosmetics-perfumes-notes>
5. <https://wou.edu/chemistry/courses/online-chemistry-textbooks/ch105-consumer-chemistry/ch105-chapter-6-hydrocarbons/>

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Evaluation method	Marks
mid-term exam / in class or on-line tests / home assignment / group discussions / oral presentations	15 Marks
Overall performance throughout the semester, Discipline, participation in different activities	05 Marks
Attendance	05 Marks

Course Prerequisites: To study this course, a student must be enrolled in B. Sc./B.Com./B.A. III semester.

Suggested equivalent online courses:

Further Suggestions:

Course Title: Chemistry of Skincare Products

Programme/Class: Diploma	Year: Second	Semester: IV
Paper-IV		
Course Code:	Course Title: Chemistry of Skincare Products	

Course Outcomes: People are always concerned about their beauty and wellbeing. The skin plays an important role in the looks and wellbeing of a person. People are getting more aware about the maintenance of their skin and it has opened the doors for the skilled persons who can provide skin care services and it has increased the turnover of the industries that dwell in the field of skincare products. This course will enable the students to know various skin care products, their classification and composition. They will learn to appreciate the role of chemistry and chemicals in providing the special effect to the component. The course will teach the students to formulate different skincare products and it will also elaborate the market size of the skin care products. Students will learn the skills such as formulation, skin problems and their treatment which will add to their chances of employability in the field of skincare products.

Credits: 3	Skill Development
Max. Marks: 25+75	Min Passing Marks:.....

Total Number of Hours = 45

Unit	Contents	Number of Hours
1	Science of Skin: Structure of skin, function of skin, common skin problems, market size of skin products	10
2	Skincare Products: Classification of skincare products, Chemical and herbal products: Creams: Foundation cream, vanishing cream, hand cream, body cream, night cream, massage cream, Powder: face powder, body powder, Colourants: lipsticks, rouges, Sun tan products: palliative, simulative. Quality control.	10
3	Formulation of Creams: Ingredients and methods of preparation of face cream, cold cream, sun tan creams. Chemistry and properties imparted by the ingredients.	08
4	Formulation of Powder: Ingredients and methods of preparation of face powder, talcum powder. Chemistry and properties imparted by the ingredients.	09
5	Formulation of Colourants and Sun tan Products: Ingredients and methods of preparation of colourants and sun tan products: lipsticks, sun tan cream. Chemistry and properties imparted by the ingredients.	08

Recommended Texts:

1. Singh, S.K. Handbook on Cosmetics. National Institute of Industrial Research, India, 2010.
2. Nanda, S., Nanda A., Khar, R.K. Cosmetic Technology. Birla, India, 2011.

3. Barel, A.O., Paye, M., Maibach, H.I. Handbook of Cosmetics Science and Technology, CRC Press, 2014.
4. Balsem, M.S. Genshon, S.D. Rieger, M.M. Sagarin, E. Strianase, S.J. Cosmetics, Science and Technology. Vol. I, II and III Ed. By M.S. Balsam and M.S. Sagarin Wiley-Interscience, A Division of John Wiley and Sons., Inc., New York, London, Sydney, Toronto, 1972.
5. Jellinick, J. Stephan. Formulation and Functions of Cosmetics. Wiley Interscience, a Division of John Wiley & Sons., New York, 1970.
6. Williams, F., Schmitt, W.H. Chemistry and Technology of the Cosmetics and Toiletries Industry. DBlackie Academic & Professional, London, 1st Edn., 1992.
7. Harry, R.G. Harry's Cosmeticology, Vol. I sixth Edn. The principles and Practice of Modern cosmetics, Chemical Publishing Co., Inc., New York, 1973.
8. Board, N. Handbook on Herbal Products (Medicines, Cosmetics, Toiletries, Perfumes) National Institute of Industrial Research, New Delhi, 2000.
9. Vimladevi, M. Textbook of Herbal Cosmetics, CBS Publishers and Distributors Pvt. Ltd, 2018.
10. Panda, Himadri. Herbal Cosmetics Handbook. Third revised edition, 2015.
11. W.A. Wani, P.F. Iqbal and M.N. Lone, Chemistry of cosmetics and perfumes, Lifestyle & Personal Style Guides.
12. Krik Othmer, Chemical Technology of cosmetics, John Wiley.
13. A.M. Dar and B.A. Dar, Chemistry of cosmetics & Perfumes, Kalyani Publications.
14. Paul Z. Bedoukian, Perfumery and Flavouring Synthetics. Second Edn, Elsevier Publishing Co., Amsterdam, London, New York, 1967.

Suggestive digital platforms web links:

1. <https://www.slideshare.net/anujames9066/skin-care-product-ppt>
2. <https://www.slideshare.net/joanvijetha/skin-care-cosmetics>
3. <https://pharmacy.hebmu.edu.cn/trywhx/resources/43/2019624163611.pdf>
4. <content/uploads/2019/05/Pouchers Perfumes Cosmetics and Soaps 10th edition 2000 .pdf>
5. <https://www.edugonist.com/wp-content/uploads/2021/09/Chemistry-and-Technology-of-the-Cosmetics-and-Toiletries-Industry-by-D.F.-Williams.pdf>

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Evaluation method	Marks
mid-term exam / in class or on-line tests / home assignment / group discussions / oral presentations	15 Marks
Overall performance throughout the semester, Discipline, participation in different activities	05 Marks
Attendance	05 Marks

Course Prerequisites: To study this course, a student must be enrolled in B. Sc./B.Com./B.A. IV semester.

Suggested equivalent online courses:

Further Suggestions:


21/5/2023

 