

CHE-271-VSC-P: Industrial Chemistry Practical-I

Course Type: VSC (Practical)

No. of Credits: 2

Course Outcomes

At the end of the course, student will be able to

1. Learn basic concepts of industrial preparations, qualitative estimations, and pollution control techniques used in chemical laboratories and industries
2. Explain the principles behind organic synthesis, water hardness estimation, and environmental sampling methods including their industrial significance.
3. Demonstrate the preparation of industrially important compounds like paracetamol and dyes, and perform titrimetric analysis for water and soil quality assessment.
4. Compare experimental results to evaluate chemical purity, water salinity, and environmental parameters using field and lab-based methods.
5. Evaluate the efficiency of pollution indicators, safety protocols, and synthetic routes based on lab outcomes and industrial practices.
6. Design and present a project/report synthesizing learnings from industrial visits and practical's to propose improvements in industrial or environmental chemical practices.

Course Content

[A] Preparations (Any Four)

1. Synthesis of m-dinitrobenzene from nitrobenzene
2. Synthesis of p-nitroacetanilide from acetanilide (Green Approach)
3. To prepare urea-formaldehyde plastic from urea and formaldehyde
4. Synthesis of phenol-formaldehyde polymer
5. Diels-Alder reaction between furan and maleic acid (Green Approach)
6. Preparation of Soap (Saponification)
7. Preparation of Ferrous Ammonium Sulfate (Mohr's Salt)

[B] Quantitative and Qualitative Analysis (Any four)

8. Estimation of available chlorine in bleaching powder (iodometric method)
9. Estimation of calcium in CAN fertilizer (complexometric method)
10. Determination of composition of dolomite (by complexometric titration).
11. Determine the saponification value of a given oil sample.
12. Analysis of AR grade and LR grade HCl and compare their molarity.
13. Determination of strength of commercially available H₂O₂

14. Assay glacial acetic acid as per Indian pharmacopeia (7 Ed, Volume-2)

[C] Sampling, Safety and pollution control (Any three)

15. Identification of bio-indicators of pollution (field/lab-based survey)

16. Estimation of alkali content in water and soap samples

17. Qualitative soil analysis (pH and water-soluble ions)

18. pH and conductivity comparison of tap vs. polluted water

19. Criteria of purity- Determination of melting and boiling points (2 organic solids/liquids)

[D] Industrially important techniques (Any one)

21. Deionization of water using ion exchange resin or zeolites

(<https://www.watertechnologies.com/handbook/chapter-08-ion-exchange>;

https://ideaexchange.uakron.edu/honors_research_projects/345/;

<https://www.sciencedirect.com/science/article/abs/pii/S0011916406000956>)

22. Identification of presence or absence of salicylic acid in aspirin tablet by TLC

(<https://scilearn.sydney.edu.au/fychemistry/SummerSchool/LabManual/E29.pdf>)

[E] Industrial Visit (Compulsory)

Visit to an Industry (ETP/Chemical Plant/Pharma Unit) and submission of a short project/report.

References

1. A.I. Vogel, A.R. Tatchell, B.S. Furnis, A.J. Hannaford, P.W.G. Smith, Vogel's Textbook of Practical Organic chemistry (1989)
2. Study Material in Vocational Subject to Industrial Chemistry (B.Sc. I, UGC) Sponsored (Text Book)
3. Experiments in polymer science, New Age Publication.
4. Unit Operations in Chemical Engineering W.L. McCabe and J.C Smith, Mc Graw- Hill Books co., New York.
5. Riegel's Handbook of Industrial Chemistry, J.A. Kent, J.A.(ed), CBS Publishers, New Delhi.
6. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher (2009)
7. S. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
8. R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.

9. Betsy, K. J., et al. "Determination of alkali content & total fatty matter in cleansing agents." *Asian Journal of Science and Applied Technology* 2.1 (2013): 8-12.
10. Tremayne, M.; Kariuki, B. M.; Harris, K. D. M. *Angew. Chem. Int. Ed. Engl.* 1997, 36, 770-772. (Synthesis of fluorescein dye)
11. Polymer Science by V.R. Gowariker
12. Practical Medicinal Chemistry, Dr. K.N. Jayaveera Dr. S. Subramanyam, Dr. K. Yogananda Reddy, S. Chand & Company Pvt. Ltd.

Suggested links for e-resources:

- ✓ <https://swayam.gov.in/>
- ✓ <https://nptel.ac.in/courses/112/104/112104113/>
- ✓ https://onlinecourses.nptel.ac.in/noc19_ph14/preview
- ✓ <http://heecontent.upsdc.gov.in/Home.aspx>
- ✓ <https://ncert.nic.in/textbook.php?kech1=0-7>
- ✓ <https://www.labster.com/chemistry-virtual-labs/>
- ✓ <http://chemcollective.org/vlabs>
- ✓ https://biocyclopedia.com/index/enivronmental_science_engineering_laboratory_methodology/determination_of_available_chlorine_in_bleaching_powder.php
- ✓ <https://www.egyankosh.ac.in/bitstream/123456789/16340/1/Experiment-22.pdf>