

ADVANCE CHEMISTRY- III (APPLIED/INDUSTRIAL CHEMISTRY)

CREDIT HOURS: 3

Course Objectives: Students will gain understanding about the importance of water and its quality requirements for the industrial uses in addition to learning about water treatment techniques. They will also learn about the composite materials.

1. Chemical Industrial Unit Operations and Processes:

Brief introduction to Chemical Industry with reference to Pakistan, Elementary treatment of general unit operations commonly used in Industry such as heat transfer; Evaporation; size Reduction; Screening; Filtration and Distillation. Chemical; Unit processes, Nitration; Sulphonation; Halogenation; Hydration; Oxidation and Hydrogenation.

2. Basic Chemical Industries

Raw materials; Chemical processes involved; flow sheet diagrams with all the important parameters concerned with the manufacturing of Sulphuric acid; Hydrochloric acid; caustic Soda; Washing soda; Oxalic Acid, Formic acid, Pthalic anhydride. Applications of these chemicals in industry.

3. Cement Industries:

Cement raw materials used for cement manufacturing, dry process, wet process, semi wet process, special cement, chemistry involved in hydration of cement, setting of cement, setting time.

4. Water Softening and Scale Removing:

Water hardness; its measurement and removal; methods used for water softening including ion-exchange and reverse osmosis, distillation and precipitation. Types of boiler scales. Chemical and mechanical methods to eliminate the scaling.

5. Glass Industries:

History of glass, raw materials used for glass, methods of manufacturing, various types of furnaces and crucibles used for the manufacture of glass, special types of glass, their manufacture and properties.

6. Soap and Detergent Industries:

Processes involved in soap manufacturing, methods used for manufacture of laundry soap, typical soaps. Recovery of glycerine. Detergents or surface active agents, cationic, anionic and non-ionic agents.

RECOMMENDED BOOKS:

1. Industrial Organic Chemicals, by H.A.Witcoff and B.J.Reuben, John Wiley & Sons Inc. New York.
2. Water Supply and Sewerage, T.J.McGhee, McGraw Hill Book Co. New York.(1991)
3. Unit operations in Chemical Engineering, Chattopadhyay, Khanna Publishers, Delhi-6 (1993).
4. Chemical Process Design, Robin Smith, McGraw Hill Book Co. New York. (1995).

5. Hand Book of Industrial Chemicals, By SIRI Board of Consultants and Engineers, Small Industries Research Institute, New Delhi (1995)
6. Small Medium and large Scale Industries, A.K. Sirivastawa, Small Industries Research Institute, New Delhi (1996).
7. The Chemistry of Cement, H.F.W. Taylor, Academic Press, London, 1964.
8. Shereve's Chemical Process Industries, 5th Ed.1975, By G.T.Austin, McGraw Hill Book Co. New York.
9. Industrial chemistry, B. K. Sharma, Krishna Prakashan Media (P) Ltd., Ed-15 (2006).
10. Chemistry of glass manufacturing, F.W.Hunter, Dower Publications, New York, 1950.

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

ADVANCE CHEMISTRY LAB- III (APPLIED/INDUSTRIAL CHEMISTRY)

CREDIT HOURS: 1

1. Preparations:

Detergent and cosmetics (Cold cream, shampoo and vanishing cream), Dentrifrice, Thermosetting and thermoplastic resins (alkyd and urea formaldehyde)

2. Titrimetry:

Estimation of water hardness by complexometry
Estimation of acetic acid contents in the vinegar sample
Determine the acidity of the sulphuric acid and its normality.
Determination of acidity, alkalinity, Free CO₂ in water
Assay of bleaching powder by free chlorine method.
Determine the %age purity of the Commercial sample of sodium chloride.
Determination of Residual Chlorine in water.
%age of reducing sugars.
Soap analysis for free and combined alkali.
Determining the %age purity of sodium bicarbonate and sodium carbonate.

3. Flamephotometry:

Estimation of Potassium in the tap water.
Estimation of Sodium in the Commercial Sodium Chloride.
Estimation of Calcium in milk.

4. Spectrophotometry:

Determination of the of KMnO₄, K₂Cr₂O₇ and CoCl₂
Estimation of nickel in vanaspati ghee.
Estimation of chloride in the tannery effluent.
Estimation of Iron in Pharmaceutical Products.
Estimation of Phosphates in fertilizers.

5. Chromatography:

Separation of mixture of ink by circular paper chromatography.
Separation of mixture of metal ions by paper chromatography.
Coating of TLC plates and separation of mixture of dyes.
Separation of different pigments of plant extract by TLC chromatography.

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

RECOMMENDED BOOKS:

1. Perfumes Cosmetics and Soaps, W.A. Poucher, Chapman and Hall 7th Ed. (1974).
2. Applied Chemistry Theory and Practice, O.P. Vermani & A.K. Narula, Wiley Eastern Limited (1989).
3. Text Book of Quantitative Inorganic Analysis, Vogel's Ed-4th, Longman Group Limited (1978).
4. Practical Statistics for the Analytical Scientist, A Bench Guide, RSC Publishing LGC Ltd 2009.