PCH001

CHEMISTRY COURSE -1

Unit-1

Instrumental techniques: **Thermo gravimetric analysis**: Introduction, types of thermo gravimetric analysis, principle and method.

Differential thermal analysis: principle of working, theory and instrumentation, simultaneous DTA-TGA curves, factors affecting results and applications.

Differential scanning colorimetry: principles of working, theory, instrumentation and applications.

Flame Photometry and Atomic Absorption Spectroscopy: Introduction, Principle, flames and flame spectra vibration of emission intensity with flames, interferences, role of temperature on absorption, atomic absorption spectroscopy, sources, hallow cathode lamp, line sources, comparative study of AAS and flame spectroscopy; applications of AAS and Flame photometry.

Unit -2

Chromatography: Definition, principles and mechanism of separation, classification of chromatographic techniques. General descriptions of column chromatography - frontal analysis, displacement analysis and elution analysis. General theory of column chromatography: characterizing a chromatogram - retention time, retention volume and baseline width. Chromatographic resolution, capacity factor, column selectivity. Column efficiency - band broadening - rate theory and plate theory. Peak capacity, non ideal behavior. Optimizing chromatographic separations using capacity factor, column selectivity and column efficiency - Van Deemter equation, and its modern versions, Golay equation and Huber-Knox equations.

Unit -3

Thin-layer chromatography (TLC): Definition, principle, mechanism, Methodology selection of stationary and mobile phases-preparation of plates, spotting, development, identification and detection, reproducibility of RF values.

High performance liquid chromatography (HPLC): Principles, instrumentation - columns (analytical and guard columns), stationary phases, mobile phases, choosing a mobile phase, isocratic *vs* gradient elution, HPLC plumbing, sample introduction. Detectors for HPLC -

spectroscopic, electrochemical and others, quantitative applications. Preparative HPLC-Applications.

Gas chromatography (GC): Principles, instrumentation - mobile phase, chromatographic columns, stationary phases, sample introduction, temperature control, and detectors for gas chromatography. Quantitative and qualitative applications.

Unit-4

Thermodynamics: Thermodynamic terms – concepts of system, surroundings, types of systems-examples, state of the system, state functions or state variables, energy- a state function, isothermal adiabatic, constant volume(isochoric)and pressure(isobaric) processes, reversible and irreversible processes, extensive and intensive properties. Internal energy: as a state function .work and heat. Change in internal energy due to work and heat. First law of thermodynamics, mathematical form. Expression for U underadiabatic process (U= w) and isothermal process (U = qv). Expressions for work done during isothermal irreversible and reversible change. Exothermic and endothermic reactions. Enthalpy: definition, change in enthalpy-sign convention.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001, John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
7. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
8. Chemical thermodynamics by F. T. Wall, W. H. Freeman & Co.
9. Elements of Classical and Statistical Thermodynamics by L.K. Nash, Addison-Wesley (1970).
10. Physical Chemistry by P.W. Atkins, ELBS, 4th edition, Oxford University Press (1990).
11. Principles of Physical Chemistry-Puri, Sharma, Pathania, Vishal Publishing Co.