

Course Code	Course Title	C	H	I	E	T
17P1CME1	ANALYTICAL CHEMISTRY-I	4	4	25	75	100

UNIT I OXIDATION AND REDUCTION AND MAGNETO CHEMISTRY 12 Hrs

Concept of oxidation and reduction potentials – periodic trends – applications of electrode potentials in the interpretation of chemical behavior. Electrode potential diagrams and their uses: Latimer diagram – Frost diagram – Pourbaix diagram – Ellingham diagram.

Magnetochemistry - magnitude of magnetic moments - experimental determination – Faraday, Guoy & NMR methods - The concept of the quenching of orbital momentum - Magnetic properties of A,E & T terms - effect of spin - orbit coupling – Temperature Independent Paramagnetism (TIP) Antiferromagnetic interactions in di and poly nuclear transition - metal complexes & solids.

UNIT II ELECTROANALYTICAL TECHNIQUE 12 Hrs

Polarography-principle-diffusion current-polarographic maxima-Ilkovic equation- Half wave potential-applications. Pulse voltammetry-normal and square wave voltametry. Cyclic voltammetry- principle and simple analytical applications-interpretation of cyclic voltammogram Amperometry - principles and applications – types of amperometric titrations with examples.

Basic principles of electrogravimetry-procedure-Coulometry-principle-coulometry at controlled potential-coulometry at constant current-coulometric titrations-advantages and its applications.

UNIT III THERMAL ANALYSIS 12 Hrs

Theory and principles of DTA and TGA – factors affecting the position of DT and TG curves – application of DTA and TGA .Thermal behavior of the following compounds using DTA and TGA analysis – crystalline copper sulphate penta hydrate, calcium oxalate monohydrate, calcium acetate monohydrate, ammonium nitrate, potassium chlorate with and without catalyst, ammonium metavanadate, zinc hexafluorosilicate – complementary nature of DTA and TGA – principle and applications of DSC - determination of degree of conversion of high alumina cement – purity determination – phase transition study.

UNIT IV CHROMATOGRAPHY AND AAS 12 Hrs

Gas-liquid chromatography-principles and its types - retention volume, instrumentation-carrier gas-column - preparation-stationary phase-detectors- Thermal conductivity detector (TCD)- flame ionization detector (FID)-electron capture detector (ECD) - applications of GLC. High performance liquid chromatography (HPLC)-Scope-column efficiency-instrumentation-column packing detectors.

Instrumentation- principle of atomic absorption spectroscopy (AAS)- Interferences –spectral, chemical and Ionisation - applications of AAS.(Qualitative analysis-Quantitative analysis)-multicomponent analysis - determination of metallic elements in biological materials -

determination of metallic elements in industrial food products-determination of Ca, Mg, Na and K in blood serum.

UNIT V ERROR ANALYSIS, ORD AND CD

12 Hrs

Error Analysis- Accuracy and Precision, Determinate and Indeterminate errors, Significant figures, Ways of expressing accuracy – Absolute and relative error, Standard deviation, Propagation of errors, The confidence limit, Tests of significance – The F and T test, Rejection of a result – The Q test, Linear least squares to plot the data, Correlation coefficient.

Optical rotary dispersion (ORD) and Circular Dichroism (CD): Rotational strength of the Chromophores - Cotton effect - Selection rules - its application to D₃ Complexes - the use of ORD & CD in determination of the structure and configuration of the metal complexes.

Text Book(s):

1. Donald, J., Pietrzyk and Clyde W. Frank, Analytical Chemistry, Second Edition, Academic Press, 1979.
2. Habart, H., Willard, Lynne, L., Merrit, John A. Dean and Frank, Settle, A., Instrumental Methods of Analysis, Seventh Edition, CBS Publishers, New Delhi, 1986
3. Douglas A. Skoog Donald M. West and F. James Holler, Analytical Chemistry, Sixth Edition, Saunders College Publishing, HBJ, New York, 1996.
4. Das, R.C., and Beher, B., Experimental Chemistry, Tata Mc. Graw – Hill Ltd., New Delhi, 1983.
5. Gurdeep, G., Chatwal, R., Anand, S. K., “Instrumental methods of chemical analysis”, Second Edition, Himalaya Publishing House, New Delhi, 2011.

Reference Books:

1. Findley, A., Practical Physical Chemistry, Ninth Edition, Longmans Green Co. Ltd., London, 1973
2. Khopkar, S.M., Basic Concepts of Analytical Chemistry, New Age International (P) Limited Publishers, New Delhi, 1998.
3. Popiel, W.J., Laboratory Manual of Physical Chemistry, The English Universities Press, London, 1964.