1. Determination of COD of a water sample,
2. Determination of dissolved oxygen (DO) by Winkler's method
3. Determination of nitrate & nitrite in water samples and sea water.
4. Analysis of heavy metals in waste water, sea water (Pb, Hg etc. By spectrophotometry)
5. Determination of available K in soil,
6. Determination of organic carbon in soil samples
7. Nephelometric determination of sulphate / phosphate.
8. Determination of alkalinity of water samples
9. Determination of fluoride in drinking water by spectrophotometry & ion selective electrode
10. Determination of phosphoric acid content in soft drinks
11. Spectrophotometric determination of sulphur and phosphorus present in soil.
12. Determination of phosphates in detergents
13. Any other experiment of interest.

REFERENCES:

1. A..I. Vogel : A Text book of Quantitative Inorganic Analysis, (ELBS), 1978.
2. APHA, AWWA and WPCF: Standard Method for the Examination of water and Waste Water (Washington DC),1989,
3. I. M. Kolthof and E.P. Sandell: Quantitative Chemical Analysis.McMillan,1980
4. I.Williams, Environmental Chemistry, Wiley, 2001
5. Lobinski and Marczenko, Comprehensive Analytical Chemistry, Vol.30, Elsevier,1996.

AC P 558: PHYSICAL CHEMISTRY PRACTICALS IV

COURSE OUTCOME:

- Includes large number of experiments which illustrate the principles of electrochemistry.
- The paper also includes few experiments from polymer chemistry topics. In addition to the above
- Able to study polymer preparation, kinetic & thermal studies.
- They learn Potentiometric titrations.

Electrochemistry :(Any EIGHT experiments are to be carried out).

1. (a) Determination of transport number of Cd^{2+} and SO_4^{2-} ions by EMF method.
2. Electroplating of (i)Nickel, (ii)Chromium,(iii) Aluminum and iv)copper on a copper plate.
3. Verification of Tafel equation of hydrogen evolution reaction.
4. . Study of rate of corrosion and inhibition efficiency of an inhibitor on mild steel/Al/Cu by weight loss method i) at different time intervals and ii) at different temperatures(to evaluate thermodynamic parameters)
1. (a) Identification of deposites by chemical spot tests.
   Determination of electrochemical equivalent of copper.
2. (a) Identification of metal ions in a mixture polarographically.
   Qualitative determination of electroreducible substances of (i)lead ion with dichromate & (ii)ferric ion with titanous ion and (c) Verification of Ilkovic equation.
6. Determination of (i) stability constant of a metal complex (lead oxalate or copper glycinate) and (ii) concentration of metal ions polarographically.
7. Kinetics of corrosion of mild steel and accelerated corrosion resistance tests.
8. Electrolytic preparation- peroxydisulphate, chlorate and perchlorate, calcium gluconate &tetrachloroquinine.

9. Potentiometric titration of (a) Non aqueous sytem and (b) mixture of strong (HCl) and weak (HAC) acid with NaOH / NH4OH and find the strength of the acids in mixture.
10. Determination of decomposition potential of an aqueous electrolytic solution.
11. Determination of the potential of an electrochemical cell and mean ionic activity coefficient.
12. Determination of acidic and basic dissociation constants and isoelectric point an amino acid pH metrically..
13. pH titration of (a) HCl versus NaOH, (b) $CuSO_4$ versus NaOH and (c) HOAC versus NaOH and (d) lead nitrate versus potassium chromate, Titration of mixture of bases (Na_2CO_3& $NaHCO_3$) with standard HCl and find the concentration of bases.
14. Determination of activity coefficient of an electrolyte at different molalities.

B. Polymers : (Any FOUR experiments to be carried out).

1. Preparation of polymers by condensation and free radical methods.
2. Study of kinetics of polymerization,
3. Thermal analysis of polymers.
4. Analysis of phenol-formaldehyde reaction products by TLC
5. Measurement of stress relaxation, creep & recovery of typical elastomers& plastics
6. Determination of molecular weight and size parameters of polymers by viscometry and turbidimetry.
7. Determination of sequences in polyvinylalcohol by viscometry.
8. Determination of molecular weight of a polymer by turbidimetry.
9. Preparation of Polymethylmethacrylate by suspension polymerization / polystyrene by free radical polymerization / Nylon by interfacial polymerization / Polyacrylamide by solution polymerisation method / polyvinylalcohol from polyvinylacetate / Phenol formaldehyde/ urea formaldehyde resins.

C. Computer related experiments

The following exercise may be given to illustrate the use of Softwares such as Excel and Origin in calculation and plotting curves using the data generated in regular lab experiments.

1. Use of mathematical functions to calculate parameters such as ionic strength, rate constants, dissociation constants, energy of activation, standard deviation, average molecular weights of polymer samples or any other similar calculation.

2. Use of software to make linear plots and calculate constants from slopes and intercepts- data from experiments such as verification of beer's law, determination of pKa of weak acids from pH data, determination of energy of activation , viscosity with concentration for determination of unknown concentration/ average molecular weight of polymers or any other similar data sets.

3. Use of software to fit multiple set of data obtained in different series of experiments on the same chart- pka of differen weak acids, kinetic data with different ionic strength conditions etc-or any other series of data may be given.

4. Use of software to fit non-linear curves with data from experiments such as absorbance vs. wavelength, first derivative curves of potentiometric and pH titrations, radioactive decay or any other similar experiments.

5. Programme writing and numerical analysis.
Use of commercial software packages such as Mathcad, Matlab, Aspan Plus, Design II, Use of Chem draw and Chem sketch for construction of molecules. Use of Window excel for drawing graphs estimation of slope intercept.

REFERENCES:-

1. Willard, Merrit,Dean&Settle:Instrumental Methods of analysis(Van Nostrand.NY)1981.
2. Sawyer and Roberts : Experimental Electrochemistry for Chemists (Wiley , N.Y)1974.
3. B.P.Levitt : Findlay's Practical Physical Chemistry, (Longman, London), 1973.
4. J.B. Yadav :Advanced Physical Chemistry Experiments (Goel Publishing House), 1988.
5. F. J. Welcher(Ed): Standard methods of Chemical Analysis (Kriegen, N.Y)1975.
6. Computers and their applications to Chemistry, Ramesh Kumari, Narosa
7. Theory and Problems of Programming with Basic, Mc graw Hill, NY,1987.
8. Computer programming in Fortran IV,V , Rajaraman, Prentice Hall of India, 1987.
9.Computers in Chemistry & Instrumentation,Vol.1-5 Mattson, Marcel Dekker, NY,1974

knowledge, the students are trained to develop skill of using computers to draw chemical structures, to plot the data and to carry out calculations using standard softwares useful in chemistry.

AC P 559: PROJECT WORK AND DISSERTAIO

COURSE OUTCOME:

Enable the students:

To design the project by collecting required background material by referring the literature

To understand the functioning and safety features in the industry.

To improve the experimental and soft skills.

To learn various analytical and instrumental techniques and interpretation of analytical data.