DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

Syllabus of

B.Sc. III YEAR

Analytical Chemistry

Semester-V & VI

[Effective from 2011-12 & onwards]

B.Sc. Third year, Analytical Chemistry

Semester V and VI

Paper ACH 301

Modern Techniques in Analysis

1. IR- Spectroscopy:

Modes of vibration, requirement for IR-radiations, instrumentation- radiant energy sources, wave length selector, detection devices. Outline of single beam and double beam IR-spectrophotometer. Applications of IR- Spectroscopy.

Numerical problems on calculations of number of vibrations and frequency of vibration and identification of compounds.

2. NMR- Spectroscopy:
   Theory of NMR,intrumentation, chemical shift, factors affecting chemical shift, spin-spin coupling,coupling constant and factors affecting it.NMR signals equivalent and non equivalent protons, interpritation of NMR spectra of simple compounds Applications of NMR and limitations of NMR. Numerical problems based on NMR.
3. Mass Spectroscopy:
   Theory, components of mass spectrometer – Inlet system, ion source accelerating system, magnetic field ion seperator, ion collector, vaccum system.Types of ions produced. Rules for interpretation of mass spectra.
4. Fluorescence spectroscopy:

Introduction, theory of fluorescence, comparison between absorption fluorescence spectroscopy. Advantages and their limitations. Factors affecting fluorescence intensity.Single beam and double beam spectrofluorometers. Applications of Fluorescence spectroscopy.

Paper ACH 302

Industrial, Microbiological and Biochemical Analysis

1. Industrial analysis:
   a) *Paints:* Defination, constituents and their functions, flash point of paints, separation of pigments, binder and thinner.Analysis of vehicle and thinner.
   b) *Pigments:* General outline of identification and analysis of pigments -organic and inorganic pigments, their qualitative chemical test, analysis of white and tinted pigments.
   c) *Pesticides:* Defination and classification of pesticides, analysis of the following in outline – DDT, Malathion, Diagionon.
   d) *Alloys:* Composition and estimation of main constituents in in the following – Stainless steel, Brass, Solder and Gun metal.
2. Microbiological analysis:
   Microscopy, principle, working, components used and care of dissecting, brightfil microscope, calibration of ocular micrometer, measurement of cell bacteria. Preparation of bacterial and blood smear, staining of bacteria- Negative staining and Gram staining.
   Sterilization techniques: Use of moist heat, dry heat, radiation, chemical methods, filtration methods.
   Alcohol effectiveness and phenol effectiveness.
   Isolation of fungi and VAM from soil (any one method).
   Isolation and identification of bacteria. Measurement of growth of bacteria. Factors affecting growth of bacteria-pH, media, temperature, relative humidity and osmotic pressure.
3. Biochemical analysis:
   a) *Proteins-*

Defination , classification, determination of net protein utilization, digestibility and biological value. Estimation of proteins by Lowry's method, Bradford method. Estimation of total free amino acid- lysine, tryptophan.

b) Carbohydrates- Defination , classification and colour reactions of carbohydrates- Molisch's test, Iodine test, Fehling test and Benedict's test. Determination of total carbohydrate by anthrone, amylase by iodine fructose pectic substances by colorimetery.

c) Nucleic acids- Defination, isolation and estimation of DNA and RNA.

d) Vitamins- Defination and Physiological activity of vitamins. Estimation of thioamine, riboflavin, niacin, carotene, cyanocobalmine.

Paper ACH 303

Laboratory course-IX

1. Estimation of Na and K by flame photo meter in the given sample.
2. Estimation of Na and K in blood serum by flame photometer.
3. Terbidimetric determination of trace of chloride and sulphate.
4. Estimation of Bi and Pb by EDTA using Xylenol orange indicator.
5. Estimation of chromium colorimetrically in stainless steel.
6. Analysis of solder for its Pb and Sn content.
7. Estimation of protein by Biuret reagent colorimetrically.
8. Fluorimetric estimation of thiamine hydrochloride and quinine sulphate.
9. Assay of pepermint oil for total ester.
10. Assay benzaldehyde in bitter almond oil.

Paper ACH 304

Laboratory course-X

1. Colorimetric estimation of amino acids.
2. Colony characteristics and growth pattern of different microorganisms
3. Isolation of bacteria using streak plate method.
4. Estimation of Iron in Iron ore - volumetrically/gravimetrically/spectrophotometrically.
5. Estimation of alluminium in bauxite gravimetrically.
6. Estimation of Nitrite and Phosphate in water by colorimetry.
7. Determination of blood sugar by Follin Wu method
8. Estimation of Cholesterol in egg /oil.
9. Analyse given sample of Gunmetal.
10. Estimation of Chlorides present in water (Mohr's adsorption indicator)

Paper ACH 305

Applied Analytical Chemistry- I

1. Inorganic analysis :
   Analysis of minerals and ores, principles of ore dressing, analysis of iron ore, manganese ore, bauxite ore, beryl ore and dolomite ore.
2. Analysis of cement, coal and coke:
   Main constituents, composition and analysis of cement, coal and coke.
3. Analysis of fertilizers:
   Defination, classification and analysis of fertilizers.
4. Environmental analysis:
   a) *Analysis of water*- colour, Odour, pH, taste, conductivity, dissolved solid, hardness, DO, COD, BOD, chlorides, sulphates, nitrites and phosphates.
   b) *Analysis of air*- Sampling, particulate matter, gaseous pollutants-SO_X, NO_X,CO_X and organic pollutants.
   c) *Analysis of effluents* – Quantitative estimation of toxic metals – Hg, Zn, Cd, Pb and As.

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Paper ACH 306
Applied Analytical Chemistry- II

1. Introduction to food analysis:
   Legislation, standard and nutrition. Sampling of food , general chemical methods of analysis. Determination of moisture, ash, titrable acidity, pH and Sodium chloride.
2. Analysis of food and food products:
   Composition and analysis (any one suitable method) of the following –
   a) Milk- Specific gravity, total solid, fat, proteins, lactose, contaminants in milk (QAS, artificial colour and antibiotic).
   b) Butter- Sampling, water, salt, curd, lactose, fat, ash, titrable acidity, pH.
   c) Wheat flour- Moisture, ash, oil, fat, protein, fiber, acidity, starch and maltose.
   d) Meat- Sample preparation, assessment of spoilage of raw meat, total volatile nitrogen extract release volume, free fatty acids of extractable fat, peroxide value of extractable fat, thiobarbituric value.
   e) Beverages- Alcohol contents.
   f) Tea- Moisture, ash, tannin and caffeine.
   g) Coca-Moisture, ash, fat and starch.
   h) Soft drink- Sampling, saccharin, benzoic acid and cyclamate.
   i) Honey- Moisture, HMF, Free acid, pH and carbohydrate.
3. Pharmaceutical analysis:
   Drug, classification of drugs, introduction to Indian pharmacopoeia. Analysis of following drugs as per IP and BP (monograms) - Amoxycillin, Analgin, Proponolol, Pilocarbine nitrate, Rifampicin, Paraacetamol, Nimuselide, Ranitidine. Limit test for iron, mercury, copper, arsenic, chloride and sulphate.

Paper ACH 307

Laboratory course-XI

1. Determination of physical parameters of waste water: pH,colour, conductivity and Oxidation reduction potential.
2. Determination of dissolved oxygen in given water sample.
3. Estimation of phosphorous in fertilizer
4. Determination of calcium in cement sample.(Titrimetry)
5. Estimation of calcium and Magnesium in dolomite ore.
6. Determination of total MnO_2 in manganese ore.
7. Analysis of water for COD.
8. Colorimetric estimation of trace of nitrogen in the given water sample using Nessler's reagent.
9. Estimation of micronutrients- Sn, Cu and Mn in soil.
10. Analysis of tea and coffee.
11. Determination of refractive index of given edible oil/solvents and determine its percentage purity.

Paper ACH 308

Laboratory course-XII

1. Determination of chlorpromazine hydrochloride (practical pharma chem. Part I, Becket and Stenlake, page 170.)
2. Determination of Phenobarbitone. (Practical pharma chem. Part I, Becket and Stenlake, page 171.)
3. Determination of Ascorbic acid (practical pharma chem. Part I, Becket and Stenlake, page 181.)
4. Colorimetric estimation of Rifampicin.(IP 1996)
5. Assay of Aspirin.
6. Assay of Isoniazid.
7. Assay of Ephedrine hydrochloride.
8. Estimation of specific gravity and total solids present in milk samples.
9. Estimation of lactose content of milk.
10. Determination of glucose in honey.
11. Estimation of phosphoric acid present in soft drink.

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