

PAPER-IV (D)
ANALYTICAL CHEMISTRY AND SPECTRAL
METHODS

Time: 3 Hrs.

M.M. 100

Note: The paper will be divided into THREE sections.

Section-A : Ten questions (short type answer) two from each Unit will be asked. Each question will be of one mark and the candidates are required to attempt all questions. **Total 10 marks**

Section-B : Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 10 marks. **Total 50 marks**

Section-C : Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 20 marks. **Total 40 marks**

UNIT-I

Introduction - Role of analytical chemistry, classification of analytical methods, classical and instrumental, types of instrumental analysis, selecting an analytical method, neatness and cleanliness, laboratory operations and practices, analytical balance, techniques of weighing, errors, volumetric glassware-cleaning and calibration of

glasswares, sample preparations-dissolution and decompositions. gravimetric techniques, selecting and handling of reagents. laboratory notebooks, safety in the analytical laboratory.

Errors and evaluation - Definition of terms - mean and median, precision standard deviation, relative standard deviation, accuracy-absolute error, relative error, types of errors in experimental data-determinate (systematic), indeterminate (or random) and gross, sources of errors and the effects upon the analytical results, methods for reporting analytical data, statistical evaluation of data, indeterminate errors, the use of statistics.

UNIT-II

Food analysis - Moisture, ash, crude protein, fat, crude fibre, carbohydrates, calcium, potassium, sodium and phosphate, food adulteration-common adulterants in food, contamination of food stuffs, microscopic examination of foods for adulterants, pesticide analysis in food products, extraction and purification of sample, HPLC, gas chromatography for organophosphates, thin-layer chromatography for identification of chlorinated pesticides in food products.

Analysis of water pollution - Origin of waste water, types of water pollutants and their effects, sources of water pollution-domestic, industrial, agricultural, soil and radioactive wastes as sources of pollution, objectives of analysis-parameters for analysis- colour,

turbidity, total solids, conductivity, acidity, alkalinity, hardness, chloride, sulphate, fluoride, silica, phosphates and different forms of nitrogen, heavy metal pollution-public health significance of cadmium, chromium, copper, lead, zinc, manganese, mercury and arsenic, general survey of instrumental techniques for the analysis of heavy metals in aqueous systems, measurements of DO, BOD and COD, pesticides as water pollutants and analysis, water pollution laws and standards.

UNIT-III

Analysis of soil, fuel, body fluids and drugs

- (a) **Analysis of soil** - Moisture, pH, total nitrogen, phosphorus, silica, lime, magnesia, manganese, sulphur and alkali salts.
- (b) **Fuel analysis** - Solid, liquid and gas, ultimate and proximate analysis, heating values-grading of coal, liquid fuels-flash point, aniline point, octane number and carbon residue, gaseous fuels-producer gas and water gas-calorific value.
- (c) **Clinical chemistry** - Composition of blood-collection and preservation of samples, clinical analysis, serum electrolytes, blood glucose, blood urea nitrogen, uric acid, albumin, globulin, barbiturates, acid and alkaline phosphates, immunoassay, principles of radio immunoassay (RIA) and applications. the blood gas analysis - trace elements in the body.

- (d) **Drug analysis** - Narcotics and dangerous drugs, classification of drugs, screening by gas and thin layer chromatography and spectrophotometric measurements.

UNIT-IV

Flame photometry - Basic principles, experimental techniques, schematic diagram and its applications in analytical work with special reference to alkali and alkaline earth metals.

Atomic absorption spectroscopy - Basic principles, advantage over flame photometer techniques, detection limit and sensitivity, interference and its applications in trace element analysis.

Mossbauer and Photoelectron spectroscopy - Principles and applications.

UNIT-V

Emission spectroscopy - Principle, excitation spectra, equipment for spectrographic analysis, qualitative and quantitative analysis.

Microwave spectroscopy - Theory, techniques and analytical applications.

Fluorescence and Phosphorescence methods - Fluorescence intensity as related to concentration, filter fluorometers, phosphorescence spectrometer, phosphorescence methods, excitation conditions, X-ray fluorescence techniques, theory and applications.