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17/01/23
UNIVERSITY DEPARTMENT OF CHEMISTRY



B.B.M.K. University, Dhanbad, (Jharkhand)

Ref. No.

Date 17.01.2023

To
DSW
BBMK University,
Dhanbad.

Sub :- Submission of a reduced syllabus of B.Sc. Sem-V.
(Theory & Practical) of DSE-02.

Respected Sir,
With reference to the above subject matter, please find enclosed herewith the reduced syllabus of both theory and Practical of B.Sc. Sem-V of DSE-02, "Instrumental methods of chemical analysis".
This is for your kind information and perusal.

Janardan Jee
Please do the needful
↓

Sincerely yours
Kumari
17.01.2023
(Dr. L. Kumari)
Head,
Univ. Dept. of Chemistry
BBMKU, Dhanbad.

Reduced Syllabus

SEMESTER-V

DSE-02A

PAPER: CHE-H-DSE-502A-T

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Marks: 15 (MSE) + 60 (ESE) = 75

Pass Marks: (MSE: 06 + ESE: 24) = 30

Instruction to Question Setter for

Mid Semester Examination (MSE): 1 $\frac{1}{2}$ Hrs.

The Mid Semester Examination shall have two components. (a) One Semester Internal Assessment Test (SIA) of 10 Marks. There will be three questions of 5 marks each, out of which two are to be answered. Each question may be subdivided into two or more parts (b) Class Attendance Score (CAS) & Day to day activities (DDA) of 05 marks.

(Attendance: Upto 75% = 1 mark; 75-80% = 1.5 marks; 80.-85% = 2 marks; 85-90% = 2.5 marks; >90% = 3 marks)

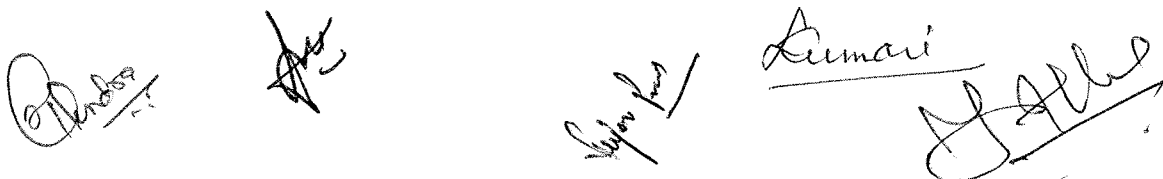
End Semester Examination (ESE): 3 Hrs.

There will be two groups of questions. **Group A is compulsory** and will contain two questions. **Q. No. 1(A)** will be multiple type six questions of 1 mark each. **Q. No. 1(B)** will contain two short answer type questions (max. 50 words) each of 3 marks. **Group B will contain descriptive type eight questions** of twelve marks each, out of which any four are to be answered.

. Unit 1:

Infrared spectroscopy:

Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat,



differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection.

UV-Visible/ Near IR – Emission, absorption, fluorescence and photoacoustic. Excitation sources (lasers, time resolution), wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution), Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time, photoacoustic, fluorescent tags).

Unit 2:

Separation techniques

Chromatography: Gas chromatography, liquid chromatography, supercritical fluids, Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis.

Unit 3: NMR Spectroscopy

Principle, Instrumentation, Factors affecting chemical shift, Spin-coupling, Applications.

Unit 4: Electroanalytical Methods

Potentiometry and Voltametry

Reference books:

1. Principles of Instrumental Analysis - 6th Edition by Douglas A. Skoog, F. James Holler, and Stanley Crouch (ISBN 0-495-01201-7).
2. Instrumental Methods of Analysis, 7th ed, Willard, Merritt, Dean, Settle.
3. P.W. Atkins: Physical Chemistry.
4. G.W. Castellan: Physical Chemistry.
5. C.N. Banwell: Fundamentals of Molecular Spectroscopy.
6. Brian Smith: Infrared Spectral Interpretations: A Systematic Approach.
7. W.J. Moore: Physical Chemistry.

SEMESTER-V

(DSE-02A:PRACTICAL)

PAPER: CHE-H-DSE-502A-P

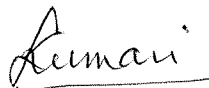
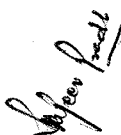
PRACTICALS- DSE LAB

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

1. Titration curve of an amino acid.
2. Determination of the void volume of a gel filtration column.
3. Determination of a Mixture of Cobalt and Nickel (UV/Vis spec.)
4. IR Absorption Spectra (Study of Aldehydes and Ketones)
5. Quantitative Analysis of Mixtures by Gas Chromatography (i.e., chloroform and carbon tetrachloride)
6. Separation of Carbohydrates by HPLC
7. Determination of Caffeine in Beverages by HPLC
8. Potentiometric Titration of a Chloride-Iodide Mixture
9. Cyclic Voltammetry of the Ferrocyanide/Ferricyanide Couple
10. Nuclear Magnetic Resonance
11. Use of capillary electrophoresis with laser fluorescence detection for nuclear DNA (Y chromosome only or multiple chromosome)
12. Laboratory analysis to confirm anthrax or cocaine.

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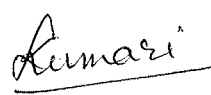
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(DSE-02A:PRACTICAL)

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