PERIYAR UNIVERSITY

Salem-636 011, Tamil Nadu, India

NAAC A Grade – State University- NIRF Rank 90

M.PHIL. DEGREE

[Choice Based Credit System (CBCS)]

Branch IV (M) CHEMISTRY

REGULATIONS AND SYLLABUS

[For the Candidates admitted from the academic year 2018 – 2019 and onwards] **CONTENTS**

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I. Program Objectives

Chemistry is a part of a larger body of knowledge called Science. Although Chemistry is concerned with only a part of the scientific knowledge that has been accumulated, it is in itself an enormous and broad field. Chemistry touches all parts of our lives. The scope of chemistry is extremely broad and it touches every aspect of our lives. The principles of chemistry are fundamental to an understanding of all processes of the living state.

The major objectives of M.Phil. Chemistry course are:

PO1 To impart knowledge in advanced aspects of all branches of chemistry

PO2 To acquire deep knowledge in the survey of literature.

PO3 To acquire specific knowledge in the specialized research area of chemistry.

PO4 To train the students in various analytical techniques.

PO5 To train the students with latest teaching and research methodologies

II. Eligibility:

Candidates who have qualified for M.Sc. Chemistry degree or M.Sc. Chemistry with specialization in Organic/Inorganic/Physical chemistry (CBCS) or M.Sc. Analytical Chemistry of this University or M.Sc. Chemistry of any other University recognized by the Syndicate as equivalent thereto shall be eligible to register for the Degree of Master of Philosophy (M.Phil.) in Chemistry and undergo the prescribed course of study in an approved institution or department of this University.

Candidates who have qualified their postgraduate degree on or after Ist January 1991 shall be required to have obtained a minimum of 55% of marks in their respective postgraduate degrees to become eligible to register for the Degree of Master of Philosophy (M.Phil.) and undergo the prescribed course of study in an approved institution or department of this University.

In the case of teachers registering for M.Phil. degree under FIP/QIP programmes, the minimum percentage of marks for registration is 50%.

For the candidates belonging to SC/ST community, and those who have qualified for the Master's degree before 01.01.1991, the minimum eligibility marks shall be 50% in their Master's Degree.

III. Duration:

The duration of the M.Phil. course shall extend over a period of one year from the commencement of the course. The one year period consists of two semesters.

IV. Course of Study:

The course of study for the degree shall consist of (a) Part-I comprising three written papers according to the Syllabus prescribed from time to time; and (b) Part-II Dissertation.

Part-I shall consist of a core paper, Paper-I Scientific Research and Methodology and an elective paper, Paper-II an advanced paper in the main subject. The candidates can opt this paper II from the elective papers float by the department time to time. A minimum of 5 students has to opt a particular paper at a time. These two papers will be dealt in the first semester of the course.

There shall also be a third paper which shall be the background paper relating to the proposed dissertation conducted internally by the Department. This syllabus of the paper will be framed by the Guide or Supervisor and handed over to the students by the end of first semester itself. This paper will be dealt in the second semester.

Structure of the Course

S.No	Paper Code	Title of the paper	Hours	L	T	P	C
FIRST SEMESTER							
Core Courses							
1	18UPCHE2C01	Research methodology	72	4	1	0	4
Elective Courses							
1	18UPCHE2E01	Spectroscopic and Instrumental methods	72	4	1	0	4
2	18UPCHE2E02	Green Chemistry	72	4	1	0	4
3	18UPCHE2E03	Chemistry of nanomaterials	72	4	1	0	4
SECOND SEMESTER							
4	18UPCHE2C02	Dissertation					

V. Scheme of Examinations:

Part-I Written Examination: Paper I, II & III

The examination of papers I and II shall be held at the end of the first semester. The duration for each paper shall be 3 hours carrying a maximum of 75 marks apart from internal (25 marks).

Paper – III examination will be conducted by the Department at the end of second semester. The duration for each paper III also shall be 3 hours carrying a maximum of 75 marks apart from internal (25 marks).

The examiners will be appointed from the panel of four names of each paper (I and II) submitted by the College/Departments concerned. If one examiner awards a pass mark and the other fail mark the, paper will be valued by a third examiner whose award of marks will be final.

S.No	Paper Code	Title of the paper	Exam Hours	I	E	T	C
FIRST SEMESTER							
Core Courses							
1	18UPCHE2C01	Research methodology	3	25	75	100	4
1	18UPCHE2E01	Elective Course	3	25	75	100	4

4	18UPCHE2G01	Background research paper-Guide paper	3	25	75	100	4
SECOND SEMESTER							
4	18UPCHE2C02	Dissertation		#50	#150	200	12
		Total				500	24

50 marks : Viva Voce #150 marks ; Dissertation

VI. Pattern of Question paper

Time: 3 Hours Max.Marks - 75

PART-A: 5x5=25

(Answer all questions)
(One question from each unit with internal choice)

1. (a) or (b)
2. (a) or (b)
3. (a) or (b)
4. (a) or (b)
5. (a) or (b)

PAPER-B: 5x10=50

(Answer all questions)
(One question from each unit with internal choice)

6. (a) or (b)
7. (a) or (b)
8. (a) or (b)
9. (a) or (b)
10. (a) or (b)

VII. Dissertation / Project Work:

Part-II – Dissertation

The exact title of the Dissertation shall be intimated one month before the end of second semester. Candidates shall submit the Dissertation to the University through the Supervisor and Head of the Department at the end of the year from the commencement of the course which shall be valued by internal examiner (supervisor) and one external examiner appointed by the University from a panel of four names sent by the Supervisor through the Head of the Department at the time of submitting the dissertation.

Dissertation / Project Work

Dissertation / Project Work: 200 marks

Concise Dissertation	**150 marks**
Viva-Voce	**50 marks**
Total	**200 marks**

The examiners who value the dissertation shall report on the merit of candidates as "Highly Commended" (75% and above) or "Commended" (50% and above and below 75%) or "Not Commended" (below 50%).

If one examiner commends the dissertation and the other examiner, does not commend, the dissertation will be referred to a third examiner and the third valuation shall be final.

Submission or resubmission of the dissertation will be allowed twice a year.

VIII. Passing Minimum:

A candidate shall be declared to have passed Part-I of the examination if he/she secures not less than 50% of the marks in each paper including Paper –III for which examination is conducted internally.

A candidate shall be declared to have passed Part-II of the examination if his/her dissertation is atleast commended.

All other candidates shall be declared to have failed in the examination.

IX. Restriction in number of chances:

No candidate shall be permitted to reappear for the written examination in any paper on more than two occasions or to resubmit a dissertation more than once. Candidates shall have to qualify for the degree passing all the written papers and dissertation within a period of three years from the date of commencement of the course.

X. Conferment of Degree:

No candidate shall be eligible for conferment of the M.Phil. degree unless he/she is declared to have passed both the parts of the examination as per the Regulations.

XI. Qualifications for persons conducting the M.Phil. Course:

No teacher shall be recognised as a Supervisor unless he possesses a Ph.D. degree or two years of PG teaching experience after qualifying for M.Phil. Degree.

XII Syllabus

I-SEMESTER

CORE PAPERS

PAPER-I

18UPCHE2C01 RESEARCH METHODOLOGY

Hours	L	T	P	C
72	4	0	0	4

Course Objectives

1. To understand the methods of survey of litrature.
2. To understand the Statistical Analysis of Data.
3. To understand the theory and principles of Separation techniques.
4. To understand the basic concepts of Practical training.
5. To study the computer operating skills.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Carry out a thorough literature survey.	K2
CO2	Analyze the statistical data.	K3
CO3	Understand the theory and usage of separation techniques.	K3
CO4	Acquire a complete practical training on effective teaching learning methodologies.	K3
CO5	Understand computer operating skills	K2

UNIT-I Survey of Literature

Primary sources – Journals of different fields of Chemistry - Secondary Sources literature search through loaded CDS. Aids of Computer devices in literature survey. location of journals, e-mail address, specific articles of science citation cards and indices, summarization of works already done and published in the chosen field. Selection of topic and facilities.

Writing and research proposal - Thesis and dissertations, style and conventions in writing, Rough drafting of the article . The general format – page and chapter format – use of quotations – foot note – tables and figures - applicability of the findings to common usage – referencing – abbreviations used etc.

UNIT-II Statistical Analysis of Data

Various types of errors – precision and accuracy – significant figures, various statistical tests on the accuracy of results, positive and negative deviation from accurate results - the Gaussian distribution – the normal distribution of random errors, mean value, variance and standard deviation, reliability interval, deviations from the Gaussian law of error distribution, t-tests-comparison of the mean with the expected value, comparison of the results of two different methods, comparison of the precision of two methods by Ftest, Gross errors and elimination of outlying results, graphical methods – Linear regression, regression line, standard deviation, correlation coefficient – Multiple Linear regression (one variable with two other variables

Unit- III Separation techniques

Methods of separation Distinction between separation and purification – basic principles of separation techniques – filtration, crystallization, fractional crystallization, solvent extraction, distillation Chromatography- Paper, Column, Ion-exchange, GC and HPLC techniques and applications

Unit –IV Practical training

Preparation of charts and models for handling classes of chemistry teacher – Creating management documents e.g. Curriculum Plan, Time Table scheduling, Evaluation – Strategies etc – Learning to write and draw on the blackboard – Preparation of power point/LCD presentations – Preparation of micro-teaching skills- Smart class room teaching.

Unit -V Computer operating skills

Starting a program and opening a document – saving and naming the document – create file and folders – deleting and un-deleting a document – closing a document – renaming and moving a document – finding a document – MS office: Word, Excel, Access, power point, out look, integrated office applications, Chem-draw and its application. internet for chemists – online search of chemistry databases, e-journals, search engines for chemistry, chemweb.

REFERENCE BOOKS

1. J. Anderson, B.H.Durston and M.Poole, "**Thesis and Assignment Writing"**, John Wiley, Sydney 1970.
2. R. **Berry**, "How to Write a **Research Paper",** Pergamon, 1969
3. Ralph Berry , **"The Research Project: How to Write It", Fourth Edition** Routledge (UK), 2000.
4. W.G. Campbell, "Form **and Style in thesis writing**", Boston M.A; Houghton Mifflin Co., 1970.
5. J.Anderson, "**Thesis and Assignment Writing**", Wilely, 1970.
6. Jerry March, "**Advanced Organic Chemistry: Reactions, Mechanisms And Structure,"** 5th ed., Wiley, 1996
7. A.I. Vogel, "**Quantitative Inorganic Analysis**", 3rd Ed., ELBS Longman London.
8. D.A.Skoog and D.M.West, **Fundamentals of Analytical Chemistry**, Holt Rinehart and Winston Publications, IV Edn, 1982.
9. W.L. Cochran, "**Statistical Methods**", Oxford and IBH Publication, New Delhi, (1967).
10. K. Balagurusamy, "**Fortran for Beginners**", Tata McGraw Hill, New Delhi, 1990.
11. K.V. Raman, "**Computer in Chemistry**", Tata McGraw Hill, New Delhi, 1993.
12. K. Balagurusamy C++, Tata McGraw Hill, New Delhi, 1995.
13. Sanjay Saxena, MS OFFICE 2000
14. Manual of MS Office Microsoft inc.
15.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	S
CO5	S	S	S	M

S- Strong; M-Medium.

PAPER –II ELECTIVE PAPERS

18UPCHE2E01 SPECTROSCOPIC AND INSTRUMENTAL METHODS

Hours	L	T	P	C
72	4	0	0	4

Course Objectives

1. To understand the theory and principles of various spectroscopic techniques.
2. To get an idea on the instrumentation of various spectral analysis.
3. To predict the structure of molecules from the spectral data.
4. To get an insight into various other applications of spectroscopy
5. To get knowledge on the electro analytical techniques

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Get basic knowledge on the principle, instrumentation and applications of rotational, vibrational and electronic spectroscopy	K4
CO2	Elucidate the structure of the compounds more precisely with NMR spectral data and also able to use ESR spectra for the effective detection of free radicals.	K4
CO3	To determine nuclear transition frequencies and relaxation times and then to relate those to a property of a material using NQR as well as to use Mossbauer spectroscopy to get an idea on the magnetic properties	K4
CO4	Using the absorption and diffraction spectroscopy for the structure elucidation of inorganic complexes.	K3
CO5	Understand the principles and applications of electro analytical techniques in the studies of properties of materials	K2

UNIT-I Rotational and Vibrational and Electronic Spectroscopy

Rotational Spectroscopy: Molecular rotations, Nuclear Quadrupole effects, Stark effect, selection rules, Instrumentation, applications.

Vibrational Spectroscopy – Molecular vibrations - IR and Raman Techniques – Vibrational Spectra and Symmetry, Assignment of bands - Structural informations Group frequencies - use of isotopes - resonance Raman spectroscopy.

Electronic Spectroscopy – principles, theory, instrumentation and applications of UV-Visible Spectroscopy

UNIT-II NMR and ESR Spectroscopy

Nuclear Magnetic Resonance Spectroscopy - Theory, Instrumentation of ^{1}H NMR and ^{13}C NMR - Chemical shift, coupling,; Applications – Nuclear resonance in solids and liquids, resolution – Double resonance methods – spin relaxation modes, etc.

Electron Spin Resonance Spectroscopy – Principles, Instrumentation, Hyperfine splittings. Interpretation of spectra, solid, liquid and solution state spectral studies; Anisotropic system – the triplet state; Theory of G-tensor, ESR of transition metal ions and complexes; ENDOR and ELDOR techniques.

UNIT-III NQR and Mossbauer Spectroscopy

Nuclear Quadrupole Resonance Spectroscopy: Principles, Instrumentation, experimental detection of NQR frequencies; interpretations and chemical applications; solid state applications.

Mossbauer Spectroscopy – The Mossbauer effect, experimental methods, Hyperfine interaction, parameters for Mossbauer spectra, applications, molecular and electronic structures. Solid state chemistry – conversion electron Mossbauer spectroscopy.

UNIT-IV Absorption and Diffraction Spectroscopy

Atomic absorption Spectroscopy –Theory, Forbidden transitions and Selections, space quantisation, Zeeman effect, the Paschen-Back effect, the Stark effect, spectral line width, the Back-Goudsmith effect, applications.

Electronic and Photoelectron Spectroscopy – Excitation and ejection of electrons, electronic energy levels, core n level PES, Symmetry of molecular orbitals, valence levels PES, Applications - transition metal complexes.

X-ray photoelectron Spectroscopy – Principles, instrumentation, X-ray fluorescence and absorption; Electron microscopy - SEM, TEM and AFM.

X-ray diffraction methods – Characterization of XRD patterns, Structure and particle size determination.

UNIT-V Electroanalytical Techniques

Polarography – Theory, DME and importance, Current Voltage curves, Diffusion current and its theory, factors affecting it. Polarographic wave and half wave potentials, applications. Oscillographic Polarography, Square wave polarography, Tensimetry. . Chronopotentiometry - Cyclic Voltammetry, Amperometry, theoretical principles, applications in chemical investigations.

Electrogravimetry – Principles and applications.

REFERENCE BOOKS:

1. William Kemp, **NMR in Chemistry**, Mac Millan, 1986.
2. A.Carrington, A.D. Melahlam, **Introduction to Magnetic Resonance,** Harper and Row, New York, 1967.
3. E.A.V.Ebsworth, David, W.H.Ranklin and Stephen Cradock, **Structural methods in inorganic chemistry,** Black well Scientific Publ., 1987.
4. R. Drago, **Physical methods in chemistry**, Reinhold, New York, 1968.
5. C.N.Banwell, **Fundamentals of molecular spectroscopy,** McGraw Hill, New York,1966.
6. J.R.Dyer, **Applications of absorption spectroscopy of organic compounds**, Prentice Hall of India Pvt. Ltd., New Delhi, 1974.
7. G.W.Ewing, **Instrumental methods of chemical analysis**, McGraw Hill Pub, 1975.
8. Doughlas. A.Skoog, **Principles of instrumental analysis**, Saunders College Pub.Co, III Edn., 1985
9. R.C. Kappor and B.S. Agarwal, **Principles of polarography,** Wiley Eastern Ltd., 1991.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	S	S	S	M
CO3	S	S	S	M	S
CO4	S	S	S	S	M
CO5	M	S	M	S	S

S- Strong; M-Medium.

18UPCHE2E02 **GREEN CHEMISTRY**

Hours	L	T	P	C
72	4	0	0	4

Course Objectives

1. To understand the fundamentals and principles of green chemistry.
2. To understand the concepts, principles and reactions of green synthesis
3. To understand the theory and principles of green synthesis techniques.
4. To understand the basic concepts of and principles of treatment methods
5. To explore the green chemistry techniques to various fields

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals and principles of green chemistry.	K2
CO2	Understand the concepts, principles and reactions of green synthesis	K3
CO3	Understand the theory and usage of green synthesis techniques.	K3
CO4	Understand the principles of treatment methods	K3
CO5	Explore the green synthesis techniques to various fields	K2

Unit I Introduction

The need for green chemistry – Twelve principles – Atom economy – Scope for green chemistry – Inception and awards.

Unit II Solvent free reactions

Exploration of solvent free reactions – Microwave assisted organic synthesis – Functional group transformations – Protection and deprotection reactions, Condensation reactions, reduction and oxidation.

Ionic liquids – Synthesis of ionic liquids – Applications in organic synthesis.

Unit III Eco-friendly green Techniques

Biocatalysts – Modified biocatalysts – Transition metal catalysts – Supported metal catalysts.

Eco-friendly synthesis and reactions of unsaturated nitroalkanes.

Heterogenised reactions – Mineral solid catalysed reactions – Solid supported catalysts – Super critical fluids.

Unit IV Alternative Treatment Technologies

Oxidation at ambient conditions for wastewater treatment – Photocatalytic reactions – Electrocatalytic reactions – Fentons chemistry – Hybrid processes. Chemical methods for dye removal – Oxidative processes – physical treatments – Biological treatments.

Unit V Exploration of Green Chemistry

Trace element speciation by hyphenated techniques – tools for analytical speciation.

Green chemicals – Prospects and future in designing new drugs.

Designing of next generation agrochemicals from nature.

REFERENCE BOOKS:

1. Rashmi Sanghi and M.M.Srivastava (Eds.), **Green Chemistry – Environment friendly alternatives**, Narosa Publishing house, New Delhi, 2003.
2. P.T.Anastas and J.C.Warner, **Green Chemistry: Theory and Practice**, Oxford Science Publications, Oxford, 1998.
3. P.Tundo and P.T.Anastas(Eds.) **Green Chemistry: Challenging Perspectives**, Oxford University Press, Oxford, 2000.
4. P.T.Anastas and T.C.Williamson(Eds.) **Green Chemistry: Frontiers in Chemical Synthesis and processes**, Oxford University Press, Oxford, 1985.
5. A.S.Matlach, **Introduction to Green Chemistry**, Marcel Decker Inc.. New York,

2001.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	S
CO5	S	S	S	M

S- Strong; M-Medium.

18UPCHE2E03 CHEMISTRY OF NANOMATERIALS

Hours	L	T	P	C
72	4	0	0	4

Course Objectives

1. To understand the fundamentals of nanotechnology.
2. To understand the principles of synthesis of nanomaterials
3. To understand the principles and instrumentation of various characterization techniques.
4. To understand the various applications of nanomaterials
5. To study the sensor applications of nanomaterials

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of nanotechnology	K2
CO2	Understand the concepts and principles of synthesis methods	K3
CO3	Characterise a nanomaterial using various characterization techniques.	K3
CO4	Apply the nanomaterials in various fields	K3
CO5	To use the nanomaterials as sensors for environmental applications	K2

Unit I Nanomaterials - An Introduction

Importance and necessity for nanomaterials-Different types of nanomaterials Nanotubes: Single and Multiwalled carbon nanotubes- nanowires, nanorods nanofibres and nanoflowers of polymers, semiconductors, metals and alloysnanocrystalline materials-nanoporous materials-nanothin films-nanocompositesnanoquantum dots.

Unit II Synthesis of Nanomaterials

Wet processes-colloidal chemical method, hydrothermal method, sol-gel method; Precipitation processes-Solid state processes-gas phase synthesis, Dry coatings- PVD, CVD, Electron beem evaporation techniques, RF sputtering-Magnetron sputteringDC and Pulsed electrodeposition-Electrophoretic deposition-Anodic oxidationAutocatalytic deposition and Laser deposition-Arc discharge and plasma polymerization methods.

Unit III Characterization of Nanomaterials

Surface morphology and nanostructure-SEM,TEM,AFM; Structural characterization-UV-Visible and FT-IR spectroscopy, XPS and ESCA; Structure orientation and microtexture-XRD- Mechanism and electrochemical bahaviour-cyclic voltammetry and EQCMB.

Unit IV Application of Nanomaterials:

Photocatalytic applications-applications of carbon nanomaterials in the field of fuel cells, batteries; Energy and environmental applications- Energy production and storage-nanomaterials as actuators and thermal insulators-membranes for chemical processes-Applications of nanomaterials in electronics, biotechnology, medicine.

Unit V Sensor Applications

Application of nanomaterials as chemical sensors-sensing components-enhanced sensing and detection- detection of biomolecules, pollutants and drugs.

References

1. K.L.Choy, **Process principles and applications of novel and cost-effective ESAVD based methods,** World Scientific Publishing, Singapore, 2002.
2. A.Jones and M.Mitchell, **Nanotechnology-Commercial Opportunity,** Evolution Capital Ltd. London, 2001.
3. C.N.R.Rao, A.Muller and A.K.Cheetham (Eds.), **The Chemistry of Nanomaterials** Vol.I & Vol.II., Wiley-VCH, 2004
4. G.Schmid (Eds), **Nanoparticles**, Wiley-VCH, 2004

5. G.Hodes(Eds.), **Electrochemistry of Nanomaterials**, Wiley-VCH, 2001.

6. M.Kohler, W.Fritzsche, **Nanotechnology**, Wiley-VCH, 2004

7. P.Ajayan, L.S.Schadler, P.V.Brawn, **Nanocomposite Science and Technology**, Wiley-VCH, 2003.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	S
CO5	S	S	S	M

S- Strong; M-Medium.

PAPER –III - (GUIDE PAPER)

18MCY103 - BACKGROUND RESEARCH PAPER

This background paper should be related to the proposed research work towards the dissertation. The Guide will give the syllabus.

II-SEMESTER

PART II 18MCY201 DISSERTATION (Project)

Candidates shall carry out research work in consultation with the guide/supervisor and submit the dissertation to the University through the Supervisor and Head of the Department at the end of the year from the commencement of the course which shall be valued by internal examiner (supervisor) and one external examiner appointed by the University from a panel of four names sent by the Supervisor through the Head of the Department at the time of submitting the dissertation.

18MCY101

M.Phil., Degree – Branch IV (M) Chemistry

(For the candidates admitted from 2018-2019 onwards)

RESEARCH METHODOLOGY

Time: Three Hours Maximum:75 marks

All questions carry equal marks

Part - A Answer All Questions (5x5=25 marks)

1. (a) How will you carry out literature survey using computer?
   (or)
   (b) How will you write a research proposal?

2. (a) Explain various types of errors in analyzing the research data.
   (or)
   (b) Write notes on linear regression and Multiple linear regression.

3. (a) Distinguish between separation and purification methods
   (or)
   (b) How will you select column for HPLC

4. (a) How will you create management documents.
   (or)
   (b) What are the latest strategies to be followed in chemistry teaching

5. (a) What are the search engines used in chemistry research
   (or)
   (b) How internet is used for chemists?

Part-B Answer All Questions (5x10=50 Marks)

6. (a) Discuss various types of primary sources in surveying the literature. (or)
   (b) Write an essay on Rough drafting of a research paper.

7. (a) i) Explain various statistical tests on the accuracy of results.
   ii) Discuss Gaussian distribution with deviations from Gaussian law of error
   (or) (b) Write notes on
   i. Normal distribution of random errors.
   ii. Gross errors iii. Elimination of outlying results
8. (a) Discuss the theory and applications of GCMS

(or)

(b) How will you isolate a compound from a mixture

9. (a) Discuss the recent methodologies used in chemistry teaching

(or)

(b) How will you improve the quality of chemistry education

10. (a) Discuss the use of computer languages used in chemistry reserach

(or)

(b) Discuss various chemistry databases and e-journals.

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18UPCE2E01

XIII Model Question Paper

M. Phil., Degree – Branch IV (M) Chemistry

(For the candidates admitted from 2018-2019 onwards)

SPECTROSCOPIC AND INSTRUMENTAL METHODS

Time: Three Hours Maximum:75 marks

All questions carry equal marks

Part - A Answer All Questions (5 x 5= 25 marks)

1. (a) Discuss the principle of spin decoupling technique in ^{1}H NMR spectroscopy.
   (or)
   (b) What is meant by Hyperfine splitting? How is it used in the predictions of ESR results?

2. (a) Write a short note on Doppler effect.
   (or) (b)
   Discuss the principle of NQR spectroscopy.

3. (a) Give a brief account on Stark effect
   (or)
   a. Explain how Fermi Resonance is used in the prediction of frequencies in IR spectroscopy.

4. (a) Discuss Zeeman effect.
   (or)
   (b) Discuss the excitation and ejection process in PES.

5. (a) What are the two parameters derived from polarograms? Explain their significances.
   (or)
   (b) Give the theoretical principles of electrogravimetry

Part-B Answer All Questions (5x10=50 Marks)

6. (a) (i) Discuss the principle of ^{13}C NMR and explain how the peak assignments are made.
   (ii) Give an account on the instrumentation of ^{1}H NMR.

(or)

(b) (i) Predict the ESR spectra of the Naphthalene radical anion, Pyrazine anion radical and Cyclopentadienyl radical and discuss. (ii) Write a note on Endor and Eldor techniques.

7. (a) (i) Discuss how the Mossbauer spectroscopy is used to study the spin states of complexes.

(ii) Explain the principle of conversion electron Mossbauer spectroscopy and write its application.

(or)

(b) (i) Discuss the instrumentation, interpretation and applications of NQR spectroscopy.

5. (a) (i) State whether the following pairs of compounds can be distinguished by their IR spectra.

(A) C_6H_5-NH_2 and $(C_6H_5)_2$ NH

(B) H_2N-C_6H_4-CO_2 Me and Me-C_6H_4-$CONH_2$ (C) MeO- C_6H_4-COMe and Me- C_6H_4-CO_2Me

(C) Cyclohexanone and 3-methyl cyclopentanone

(ii) What is Raman effect? Give an account on the applications of it.

(or)

(b) Discuss the theory, instrumentation and applications of microwave spectroscopy.

(10)

9. (a) (i) How will you ascertain the structure and orientation of a compound using XRD?

(ii) How is PES applied in predicting the valence levels in transition metal complexes.

(or)

(b) Discuss the theory of AAS and enumerate its applications

10. (a) (i) How are amperometric titrations carried out? Discuss the principles involved. Give their merits and demerits.

(ii) Account for the following:-

(A) Polarographic analysis of a solution must be carried out in presence ofan excess of added inert electrolyte.

(A)Removal of oxygen from analyte is very essential in polarographic analysis

(B) A very low concentration of a surface-active material must be present in the analyte subjected to polarographic analysis.

(or)

(b) (i) Discuss the theory and applications of cyclic voltammetry.

(ii) Write a note on electrogravimetry. (iii) Write a note on electrogravimetry.

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18UPCHE2E03

M.Phil., Degree – Branch IV (M) Chemistry
(For the candidates admitted from 2018-2019 onwards)

CHEMISTRY OF NANOMATERIALS

Time: Three Hours Maximum: 75 marks

All questions carry equal marks

Part – A Answer All Questions (5x5=25 marks)

1. (a) What is the importance and necessity for studying nanomaterials?.

(or)

(b) What are nanocrystalline materials? Explain with examples

2. (a) How will you synthesize nanoporous oxide films?

(or)

(b) Write notes on CVD

3. (a) How will you characterize a nanomaterial by SEM?

(or)

(b) Write notes on structure orientation of nanomaterials.

4. (a) Discuss the applications of nanomaterials in the field of energy.

(or)

(b) How nanomaterials are used in the field of biotechnology?

5. (a) What are nanosensors?. Explain with examples

(or)

(b) How nanosensors are used in detection of pollutants?

Part-B Answer All Questions (5x10=50 Marks)

6. (a) Discuss various kinds of carbon nanotubes. (15)

(or)

(b) Define and explain different types of nanomaterials. (15)

7. (a) Discuss the various wet processes of synthesizing nanomaterials? (15)

(or)

(b) Write notes on RF and magnetron sputtering. (15)

8. (a) How will you study the structure of nanomaterials using XPS and ESCA?(15)

(or)

(b) How will you characterize a nanomaterial by Cyclic voltammetry? (15)

9. (a) Write an essay about the applications of nanomaterials in electronics. (15)

(or)

(b) How membranes are used in environmental separations? (15)

10. (a) How nanobiosensors are used in detection of medicine? (15)

(or)

(b) Write notes on various applications of chemical nanosensors (15)

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List of Question paper setters / Examiners

From Periyar University & Affiliated Colleges		Outside Periyar University	
S. No.	**Name and Address**	**S. No.**	**Name and Address**
1.	Dr. V. Raj Professor and Head Department of Chemistry Periyar University, Salem – 636 011	1.	Dr. P. S. Mohan Professor, Department of Chemistry Bharathiyar University, Coimbatore – 641 046
2.	Dr. P. Viswanathamurthi Professor Department of Chemistry, Periyar University, Salem – 636 011	2.	Dr. A. Ilangovan Professor, Department of Chemistry Bharathidasan University, Tiruchirapalli – 24
3.	Dr. D. Gopi Professor Department of Chemistry Periyar University, Salem – 636 011	3.	Dr. M.G. Sethuraman Professor and Head Department of Chemistry Gandhigram Rural University, Gandhigram - 624 302, Dindigul
4.	Dr. A. Lalitha Assistant Professor Department of Chemistry Periyar University, Salem – 636 011	4.	Dr. Vasantha Professor and Head Department of Natural Products Chemistry School of Chemistry, Madurai Kamaraj University, Madurai 625 021
5.	Dr. R. Rajavel Assistant Professor Department of Chemistry Periyar University, Salem – 636 011	5.	Syed Shafi Professor and Head Department of Chemistry Tiruvalluvar University Vellore
6.	Dr. V. Sujatha Assistant Professor Department of Chemistry Periyar University, Salem – 636 011	6	Dr. R. Karvembu Professor Department of Chemistry National Institute of Technology Tiruchirapalli
7.	Dr. K. Shanmuga Bharathi Assistant Professor Department of Chemistry Periyar University, Salem – 636 011	7.	Dr. T.M. Sridhar Assistant Professor and Head (i/c) Department of Analytical Chemistry University of Madras, Guindy Campus, Chennai-600 025
8.	Dr. Umarani Associate Professor and Head Department of Chemistry Govt. Arts College, Salem – 636 007	8.	Dr. K. Krishnasamy Associate Professor Department of Chemistry, Annamalai University, Annamalai Nagar, Chidambaram, Tamil Nadu
	Mrs. Sankari Assoc. Prof. & Head of Chemistry Sri Sarada College, Salem	9.	Dr. S. Abraham John Professor of Chemistry Gandhigram Rural Institute, Gandhigram