PERIYAR UNIVERSITY

SALEM – 636 011

M.Phil. DEGREE
[Choice Based Credit System (CBCS)]

Branch IV (M) CHEMISTRY

REGULATIONS AND SYLLABUS

[For the Candidates admitted from the academic year 2009 – 2010 and onwards]

CONTENTS

I. Objectives of the Course

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:

- To impart knowledge in advanced aspects of all branches of chemistry
- To acquire deep knowledge in the survey of literature.
- To acquire specific knowledge in the specialized research area of chemistry.
- To train the students in various analytical techniques.

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.

M.Phil. Chemistry (CBCS)

Sl. No.	Paper Code	Title of the Paper	Exam Hours	I	E	T	C
Core Courses							
1.	09QCHEC01	Scientific Research and Methodology	3	25	75	100	4
2.	09QCHEC02	Elective Paper: Spectroscopic and Instrumental Methods in Chemical	3	25	75	100	4

		Investigations					
3.	09QCHEC03	Background Research Paper (Guide Paper)	3	25	75	100	4
4.	09QCHEC04	Dissertation	--	*50	#150	200	12
Total						500	24

*** 50 Marks – Viva-Voce # 150 Marks - Dissertations**

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.

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

Hours	L	T	P	C
72	4	0	0	4

CORE PAPERS

PAPER-I

09QCHEC01 SCIENTIFIC RESEARCH AND METHODOLOGY

UNIT-I Survey of Literature

Primary sources – Journals, Papers, reviews, communications, notes, patents, Journals of different fields of Chemistry (Organic, Inorganic, Physical, Polymer, Pharmaceutical, Industrial and Analytical)

Secondary Sources –Titles, importance of categorization and their importance, Abbreviations of names, Nomenclature of compounds and their usage.

Abstracts –Types (Chemical, Physical, Analytical), Survey of abstract indexes (substance index, author index, general technique index, collective and comprehensive indices), Beiestein compounds and tables of information. Chemical abstract search through loaded CDS. Aids of Computer devices in literature survey.

Selection of topic and facilities - Selection of specific topics of research laboratory and instrumental facilities –location of journals, e-mail address, specific articles of science citation cards and indices, summerisation of works already done and published in the chosen field.

UNIT-II Proposal, Paper and Thesis Writing

Assignments and test papers, Thesis and dissertations, style and conventions in writing, selection of topic.

Rough drafting of the article – Tile, Abstract, Introduction, Literature review problem and time limitation, Experimental methods, Results and discussions,

Foot notes, Figures, Data presentations, Tables, Sign convention followed – Biblography, Conclusions and recommendations.

The general format – page and chapter format – use of quotations – foot note – tables and figures. Results and discussions – applicability of the findings to common usage – referencing – abbreviations used etc.

UNIT-III 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 F-test, 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-IV Introduction to Computing and Networking

Introduction to computers and computing – hardware, Basic organization of a computer, CPU, Main memory, Secondary storage, I/O device, Software, System and application software, High and low level languages, Compilers, Algorithms and Flow charts.

Introduction to networking – Computer networks, Network components, Hubs, switches, repeaters, routers, bridges and gateways – LAN, WAN, internet and internet worldwide web, internet for chemists – online search of chemistry databases, e-journals, search engines for chemistry, chemweb.

UNIT-V C – Programming

Structure of a C program – Data types, Constants and Variables, Keywords, Operators and Expression.

Control structure – if, if-else, nested if-else, while, while-do, for, nested for, goto, continue, break, switch case statements.

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.

PAPER –III - (GUIDE PAPER)

09QCHEC03 - BACKGROUND RESEARCH PAPER

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

PAPER –II

Hours	L	T	P	C
72	4	0	0	4

ELECTIVE PAPERS

09QCHEC02 - SPECTROSCOPIC AND INSTRUMENTAL METHODS IN CHEMICAL INVESTIGATIONS

UNIT-I Resonance Spectroscopy -I

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's, solid, liquid and solution state spectral studies; Anisotropicsystem – the triplet state; Theory of G-tensor, ESR of transition metal ions and complexes; Endor and Eldor techniques.

UNIT-II Resonance Spectroscopy -II

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-III Absorption Spectroscopy

Microwave or 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.

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 Spectroscopy – Principles, instrumentation, X-rays fluorescence, absorption and diffraction methods. The electron microscope – non-dispersive X-ray absorption.

X-rays diffraction methods – Polymerization characteristics, Particle size determination.

UNIT-V Electroanalytical Techniques

Polarography – Theory, DME and importance, Current Voltage curves, Diffusion current and its theory, factors affection 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.

Hours	L	T	P	C
72	4	0	0	4

09QCHEC02 GREEN CHEMISTRY

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.

Hours	L	T	P	C
72	4	0	0	4

09QCHEC02 - CHEMISTRY OF NANOMATERIALS

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 alloys-nanocrystalline materials-nanoporous materials-nanothin films-nanocomposites-nanoquantum 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 sputtering-DC and Pulsed electrodeposition-Electrophoretic deposition-Anodic oxidation-Autocatalytic 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.

PART II

09QCHEC04 DISSERTATION

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.

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

(For the candidates admitted from 2009-2010 onwards)

09QCHEC01 SCIENTIFIC RESEARCH AND METHODOLOGY

Time: Three Hours Maximum:75 marks

Answer All Questions
All questions carry equal marks

Part - A (5x5=25 marks)

1. (a) How will you carry out literature survey using abstracts?

(or)

(b) How will you select a research topic?

2. (a) Write notes on rough drafting of the thesis.

(or)

(b) How will you write a research proposal?

3. (a) Explain various types of errors in analyzing the research data.

(or)

(b) Write notes on linear regression and Multiple linear regression.

4. (a) Discuss the use of algorithms.

(or)

(b) How internet is used for chemists?

5. (a) What are constants and variables. Explain

(or)

(b) Write the usage of if-then and if-else statements.

Part-B (5x10=50 Marks)

6. (a) Discuss various types of primary sources in surveying the literature. (15)

(or)

(b) How are the following used in literature survey? (5+5+5)
i) Aids of Computer devices
ii) Secondary sources
iii) Beilstein's compounds and tables of information

7. (a) How will you write the various parts of a thesis? (15)

(or)

(b) Write an essay on Rough drafting of a research paper. (15)

8. (a) i) Explain various statistical tests on the accuracy of results. (8)
ii) Discuss Gaussian distribution with deviations from Gaussian law of error(7)

(or)

(b) Write notes on (5+5+5)
i) Normal distribution of random errors.
ii) Gross errors
iii) Elimination of outlying results

9. (a) Write an essay about the basic organization of a computer (15)

(or)

(b) Discuss about LAN and WAN. (15)

10. (a) How will you write a C program for a chemical problem? (15)

(or)

(b) Write notes on (5+5+5)

(i) Operators and expressions
ii) swith case statements
iii) GO TO and CONTINUE statements

XIII Model Question Paper

M.Phil., Degree – Branch IV (M) Chemistry
(For the candidates admitted from 2009-2010 onwards)

09QCHEC02 SPECTROSCOPIC AND INSTRUMENTAL METHODS IN CHEMICAL INVESTIGATIONS

Time: Three Hours Maximum:75 marks

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

(b) Explain how Fermi Resonance is used in the prediction of frequencies in IR spectroscopy.

(or)

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 (5x10=50 Marks)
Answer All Questions

6. (a) (i) Discuss the principle of ^{13}C NMR and explain how the peak assignments are made. (10)

(ii) Give an account on the instrumentation of ^{1}H NMR. (5)

(or)

(b) (i) Predict the ESR spectra of the Naphthalene radical anion, Pyrazine anion radical and Cyclopentadienyl radical and discuss. (3x3=9)

(ii) Write a note on Endor and Eldor techniques.

(2x3=6)

7. (a) (i) Discuss how the Mossbauer spectroscopy is used to study the spin states of complexes. (9)

(ii) Explain the principle of conversion electron Mossbauer spectroscopy and write its application. (6)

(or)

(b) (i) Discuss the instrumentation, interpretation and applications of NQR spectroscopy. (3x5=15)

8. (a) (i) State whether the following pairs of compounds can be distinguished by their IR spectra. (4x2=8)

(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

(D) Cyclohexanone and 3-methyl cyclopentanone

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

(7)

(or)

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

(15)

9. (a) (i) How will you ascertain the structure and orientation of a compound using XRD?
(10)

(ii) How is PES applied in predicting the valence levels in transition metal complexes.
(5)

(or)

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

(15)

10. (a) (i) How are amperometric titrations carried out? Discuss the principles involved. Give their merits and demerits.
(9)

(ii) Account for the following:- (3x2 = 6)

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

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

(C) 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.

(10)

(ii) Write a note on electrogravimetry. (5)

M.Phil., Degree – Branch IV (M) Chemistry
(For the candidates admitted from 2008-2009 onwards)
09QCHEC02 CHEMISTRY OF NANOMATERIALS

Time: Three Hours Maximum: 75 marks

Answer All Questions
All questions carry equal marks
Part - A (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 (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)

XIV List of Examiners

From Periyar Univ & Affliated Colleges		Outside Periyar University	
S.No.	**Name and Address**	**S.No.**	**Name and Address**
1.	Dr. A.K. Ramasamy Professor and Head Department of Chemistry, Periyar University, Salem – 636 011.	1.	Dr. S. Muthusubramaniyan Professor of Organic Chemistry School of Chemistry Madurai Kamaraj University Madurai- 625 021
2.	Dr.P.Viswanathamurthi Reader Department of Chemistry, Periyar University, Salem – 636 011.	2.	Dr. A. Krishnaiah Dept.of Chemistry Sri Venkataswara (S.V.) University Tirupati-517502
3.	Dr.V.Raj Reader Department of Chemistry, Periyar University, Salem – 636 011.	3.	Dr.M . Kandasamy Professor and Head Department of Inorganic Chemistry, University of Madras, Guindy campus Chennai- 600 025
4.	Dr.R.Rajavel Lecturer Department of Chemistry, Periyar University, Salem – 636 011.	4.	Dr. S. Rajeswari Professor and Head Department of Analytical Chemistry University of Madras, Guindy campus Chennai- 600 025
5.	Dr.D.Gopi Lecturer Department of Chemistry, Periyar University, Salem – 636 011.	5.	Dr.S. Kabilan Professor of Organic Chemistry Annamalai University Annamalai Nagar Chidambaram.
6.	Dr.A. Lalitha Lecturer Department of Chemistry, Periyar University, Salem – 636 011.	6.	Dr. S. Sriman Narayanan Professor Department of Analytical Chemistry University of Madras, Guindy campus, Chennai- 600 025
7.	Dr.V. Sujatha Lecturer Department of Chemistry, Periyar University, Salem – 636 011.	7.	Dr.K.Pituchumani Professor of Organic Chemistry School of Chemistry Madurai Kamaraj University

			Madurai- 625021
8.	Mrs. Mariyammal SG Lecturer in Chemistry J.K.K. Nataraja College of Arts & Science, Komarapalayam.	8.	Dr. P. Manisankar Professor and Head Department of Industrial Chemistry Alagappa University Karaikudi-630003
9.	Dr. V. Raghunathan Reader and Head Department of Chemistry Kanadaswamy Kandar's College P. Velur, Namakkal	9.	Dr. P.S. Mohan Department of Chemistry Bharathiar University Coimbatore- 46