BHARATHIAR UNIVERSITY, COIMBATORE-641 046
M. Sc. CHEMISTRY DEGREE COURSE WITH COMPULSORY DIPOLMA
(AFFILIATED COLLEGES – CBCS PATTERN)
(For Candidates Admitted During the Academic Year 2009-2010 Batch & Onwards
SCHEME OF EXAMINATIONS

Sem.	Study Components	Course title	Ins.hrs/ week	Exam				Credit
				Dur.Hrs.	CIA	Marks	Total Marks	
I	Paper - I	Organic Chemistry – I (Organic reaction mechanisms)	5	3	25	75	100	5
	Paper - II	Inorganic Chemistry – I (Nuclear chemistry etc)	5	3	25	75	100	5
	Paper - III	Spectroscopy, Group theory and computer in Chemistry	5	3	25	75	100	4
	Elect./Dip.	Paper I	3	3	25	75	100	3
	Practical - I	Organic Chemistry – I	4	-	-	-	-	-
	Practical - II	Inorganic Chemistry – I	4	-	-	-	-	-
	Practical - III	Physical Chemistry – I	4	-	-	-	-	-
				-	-	-	-	-
II	Paper - IV	Organic Chemistry – II (Organic reaction mechanisms)	5	3	25	75	100	5
	Paper - V	Physical Chemistry-I (Quantum chemistry and Spectroscopy)	5	3	25	75	100	4
	Paper - VI	Physical Methods in Chemistry	5	3	25	75	100	4
	Practical - I	Organic Chemistry – I	4	6	40	60	100	4
	Practical - II	Inorganic Chemistry – I	4	6	40	60	100	4
	Practical - III	Physical Chemistry – I	4	6	40	60	100	4
	Elective/ Dip.	Paper II	3	3	25	75	100	3
III	Paper - VII	Organic Chemistry – III (Chemistry of natural products)	5	3	25	75	100	5
	Paper - VIII	Physical Chemistry – II (Thermodynamics)	5	3	25	75	100	5
	Paper - IX	Kinetics of polymerization	5	3	25	75	100	4
	Elect./Dip.	Paper III	3	3	25	75	100	3
	Practical - IV	Organic Chemistry - II	4	-	-	-	-	-
	Practical - V	Inorganic Chemistry - II	4	-	-	-	-	-
	Practical - VI	Physical Chemistry - II	4	-	-	-	-	-

IV	Paper - X	Inorganic Chemistry – II (Coordination chemistry)	6	3	25	75	100	5
	Paper - XI	Physical Chemistry – III (Reaction kinetics and electro chemistry)	6	3	25	75	100	4
	Paper - XII	Polymer technology	6	3	25	75	100	4
	Practical - IV	Organic Chemistry - II	4	6	40	60	100	4
	Practical - V	Inorganic Chemistry - II	4	6	40	60	100	4
	Practical - VI	Physical Chemistry - II	4	6	40	60	100	4
	Elective/ Dip.	Paper IV	-	-	-	-	100*	3
		Total					2200	90

* Project report - 80 marks; Viva-voce – 20 marks

For Practical examiners, 60 marks should be given for experiment alone and no marks for the record works from this 60 marks.

List of Group Elective/Diploma papers (Colleges can choose any one of the Group/Diploma papers as electives)

	GROUP A Diploma in Industrial Chemistry	GROUP B Diploma in Nanoscience	GROUP C Diploma in Soil Science and Phytochemistry
Paper I/ Sem I	Dye Chemistry / Corrosion Chemistry	Fundamentals of Nanoscale Science	Soil Environment
Paper II/Sem II	Industrial Chemistry	Nanomaterials Synthesis	Phytochemistry and Instrumentation
Paper III/Sem III	Water Pollution and Industrial Effluent Treatment	Characterization and Application of Nano Materials	Pharmacognosy and Drug Production
Paper IV/Sem IV	Project Work	Project Work	Project Work

Note :

1. The Syllabus for the above papers (except elective papers B & C) be the same as prescribed for the academic year 2007- 08.
2. The syllabus for the elective papers B & C are furnished below :

GROUP B - Diploma Paper I

FUNDAMENTALS OF NANOSCALE SCIENCE

Unit I: Basics of Nanotechnology I

Background to Nanotechnology – scientific revolutions – types of nanotechnology and nanomachines – atomic structure molecules & phases – molecular and atomic size – surfaces and dimensional space – top down and bottom up Nanoscale formation

Unit II: Forces between atoms and molecules

Strong intermolecular forces – covalent and coulomb interactions – interactions involving polar molecules and polarization – weak intermolecular forces and total intermolecular pair potentials – Van der Waals forces – repulsive forces; special interactions such as hydrogen –bonding, hydrophobic and hydrophilic interactions

Unit III: Nanostructures and their properties

Definition of nano systems – dimensionality and size dependent phenomena in Quantum dots, and Quantum wires – size dependent variation in magnetic, electronic transport properties

Unit IV: High vacuum technology

Evaporation theory – different sources for evaporation – working principles of rotary and diffusion pumps – cryogenic pumps – cryo sorption and getter pumps – vacuum materials

References:

1. Nanotechnology: basic science and emerging technologies – Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Overseas Press (2005)
2. Amorphous and Nanocrystalline Materials: Preparation, Properties, and Applications, A.Inoue, K.Hashimoto (Eds.,) (2000)
3. Understanding Nanotechnology, Scientific American, editors at Scientific American, Warner Books (2002)
4. Introduction to Nanotechnology, Charles P. Poole, Frank J. Owens, Wiley-Interscience (2003)
5. Nanotechnology: A Gentle introduction to the Next Big Idea, Mark A. Ratner, Daniel Ratner, Mark Ratne, Prentice Hall PTR; 1st edition (2002)
6. Fundamentals of Surface and Thin Film Analysis, Leonard C.Feldman and James W. Mayer
7. Hand book of thin film technology, L.I. Maissel and R. Glang (McGraw – Hill Book Company)

GROUP B - Diploma Paper II
NANOMATERIALS SYNTHESIS

Unit I: Sol-gel processing

Fundamentals of sol-gel process – sol-gel synthetic methods for oxides – other inorganics and nano composites – the Pecheni method – silica gel – Zirconia and Yttrium gel – aluminosilicate gel – polymer nano composites

Unit II: Film deposition methods

Introduction – fundamentals of film deposition – thermal evaporation – molecular beam epitaxy – pulsed laser deposition – sputter deposition – chemical vapour deposition – layer by layer growth and ultra thin films – chemical solution deposition – Langmuir Blodgelt films.

Unit III: Synthesis of nanostructures

Surface Chemistry and its role to prepare quantum dots – Polymer as quantum dot size stabilizer – One-dimensional (1D) by Spontaneous Growth – 1D structure by VLS and SLS Growth – Template Assisted Growth – Electrochemical growth of 1D structures

Unit IV: New forms of carbon

Types of nanotubes – formation of nanotubes – methods and reactants – arcing in the presence of cobalt – laser methods – ball milling – chemical vapour deposition methods – properties of nano tubes – plasma arcing – electro deposition – pyrolytic synthesis – Zeolites and templated powders layered silicates.

References:

1. Nanoelectronics and Information technology: Advanced electronic materials and novel devices (2^{nd} edition), Rainer Waser (Ed.), Wiley – VCH Verlag, Weiheim (2005)
2. Nanocomposite science and technology, Pulickel M. Ajayan, Linda S. Schadler, Paul V. Braun, Wiley – VCH Verag, Weiheim (2003)
3. Amorphous and Nanocrystalline Materials: Preparation, Properties, and Applications, A.Inoue, K.Hashimoto (Eds.,) (2000)
4. Quantum Heterostructures: Microelectronics and Optoelectronics, Vladimir Mitin
5. Theory of Modern electronic semiconductor devices, K.F. Brennan and A.S. Brown
6. Semiconductor Nanostructures for Optoelectronic applications, Todd D. Steiner
7. Smart Electronic Materials (Fundamentals and applications), Jasprit Singh
8. The Physics of Low dimensional semiconductors, John H. Davies

GROUP B - Diploma Paper III

CHARACTERIZATION AND APPLICATION OF NANO MATERIALS

Unit I: Nano characterizing tool 1

Working of Atomic Force Microscopy – Mode of operations (qualitative) and its application – X-Ray diffraction basics and its application to Size Analysis of nanomaterials – NMR Basics and application to Nanomaterials

Unit II: Nano characterizing tool 2

Scanning Electron Microscope: Theory- Instrumental setup and its application – Low KV SEM and its application – Low temperature SEM and its application – working of electron probe micro analysis and its application in elemental analysis – EDX spectra

Important material systems – optical process in semiconductors – optical process in quantum wells – semiconducting optoelectronic devices – organic optoelectronic devices (qualitative)

Unit III: Applications of nanomaterials

Quantum dot IR photo detectors- Quantum dot lasers – Synthesis of Zinc oxide nanomaterials and its application – Synthesis of group three nitride nanostructures and their applications - SK growth of germanium dots on silicon and its application.

Unit IV: Cell Biology (quantitatively)

Amino acids, Protein structure: Primary, Secondary, teritary, structure of Nucleic acids – Nucleosides and Nucleotides – physical properties of nucleosides & nucleotides – base pair – mismatch base pair – stacking – Backbone of Nucleic acids

Antibodies and their use in nano based drug delivery and imaging – Tumor targeted drum delivery.

References:

1. Nanoscale calibration and Standards and Methods Edited by C.Wilkening and Koenders
2. Fundamentals of Surface and Thin Film Analysis, Leonard C.Feldman and James W. Mayer
3. Scanning Electron Microscopy for Nanotechnology Edited by W.Zhou and Z. Lin Wang
4. Nanosystem characterizationtools in the life sciences Edited by Challa Kumar
5. Nanostructures and Nanomaterials (Synthesis, Properties and Applications), Guozhong Cao
6. Nanoelectronics and Information technology Edited by Rainer Waser
7. Cell and Molecular Biology, Gerald Karp
8. Nucleic Acids in Chemistry and Biology, G. Michael Blackburn and Michal J. Gait
9. Principles of Nucleic Acid structure, Worfram Saenger

GROUP C DIPLOMA PAPER-1 : SOIL ENVIRONMENT

UNIT-1:

Soil – Definition – Components of soil- Soil physical properties – Soil texture and structure, bulk density, particle density, pore space, Soil air, Soil temperature, Soil water, Soil consistency – Significance of physical properties to plant growth – Soil physical constraints and their management

UNIT-2:

Principles of soil classification: Aims of soil classification –Main classificatory units of soil classification – Soil order – Suborders –Great soil group, Series, Types and pores, Soil survey – Objectives and types – Chief soil types of India

UNIT-3:

Soil fertility and soil productivity – Essential plant nutrients, their functions – Deficiency and toxicity symptoms. Fertilizers – Definition – Nitrogenous fertilizers – Phosphate fertilizers – Classification – Sources – Reactions in soils – Residual activity – Micronutrient fertilizers – Complex and mixed fertilizers – Sources – Properties and reactions in soil. Fertilizer use efficiency – Methods of fertilizer application

UNIT-4:

Organic manures – their role in soil fertility – Green manure – Green leaf manure –Bulky organic manures, FYM – Compost – Vermicompost - Recycling of organic wastes – Bioinoculants – Organic farming – Integrated nutrient management – their significance in soil fertility.

UNIT-5:

Soil conservation: Introduction and factors affecting soil fertility – Soil erosion – Definition and types of erosion – Agencies causing erosion – Soil conservation Aims – Practical methods of soil conservation – Biological – Agronomic practices – agrostological - Dry farming practices – Engineering or mechanical methods – Basin.leaching – Pan breaking – Contour terracing – Contour trenching

REFERENCES:

1. Thomson and Troen 1975. Soils and soil fertility Tata, McGraw Hill Publication Co.Ltd. New Delhi.
2. Tisdale S.L. Helson, W.L. and Beaton, J.D.1990. Soil fertility and Fertilizers. The MacMillan Publishing Co., 5th Edn. New York.
3. Subba Rao,N.S.1997.Biofertilizers in Agriculture and Forestry. India Book House Limited
4. Rai, MK.2006.Handbook of Microbial Biofertilizers. The Haworth Press Inc.
5. Tolanus, S.2006. Soil fertility, Fertilizer and Integrated Nutrient management. International Book Distributery Co.
6. White, R.E. 2005. Principles and practice of soil science 4th Ed. Blackwell publishing.
7. Ashman, M.A. and Puri. G. 2002. Essential soil science. Blackwell publishing.
8. Millar .C.E.2004. Soil fertility. Biotech Books.

GROUP C
DIPLOMA PAPER II. PHYTOCHEMISTRY AND INSTRUMENTATION

UNIT 1. Primary metabolites:
Carbohydrates, proteins and lipids and their classification-structure and functions.

UNIT 2. Secondary metabolites:
Alkaloids, flavonoids, phenolic groups, terpenoids and glycosides-occurrence-distribution-biosynthesis-medicinal uses.

UNIT 3. Identification of secondary metabolites:
Qualitative screening methods for alkaloids, flavonoids, phenolic groups and glycosides. Estimation of alkaloids, flavonoids, phenolic groups and glycosides from plant tissues.

UNIT 4. Extraction and separation techniques:
Soxhlet extraction-Ultrasonic water bath extraction-Chromatography-Centrifugation-Electrophoresis.

UNIT 5. Phytochemical analysis and chemical characterization:
Colorimeter-Spectrophotometer-HPLC-GC-MS-NMR.

REFERENCES:

1. Dey, P. M. and Harborne, J. B. 2000. Plant Biochemistry, Harcourt Asia Pte Ltd, Singapore.

2. Harborne, J. B. 1975. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis, Chapman and Hall, London, UK.

3. Wilson, K. and Walker, J. 1995. Practical Biochemistry, University of Cambridge, New York, USA.

4. Panda, H. 2004. The Complete Technology Book on Natural Products (Forest based).
Asia Pacific Business Press Inc. Delhi, India.

GROUP C
DIPLOMA PAPER III. PHARMACOGNOSY AND DRUG PRODUCTION

UNIT 1. Crude drug identification:
Historical notes-Organoleptic identification-Microscopic identification-Pharmaconostic classification of herbal drugs.

UNIT 2. Microscopic drug identification:
Micromorphology of standard drugs-Histological maceration-Histochemical localization.

UNIT 3. Biochemical and Physiochemical evaluation of herbal drugs.

UNIT 4. Extraction of secondary metabolites from in vitro cultures-elicitation of drug production-drug evaluation and standardization.

UNIT 5. Extraction methods-from field grown plants and its purification.

REFERENCES:

1. Gokhale, S. B., Kokate, C. K. and Purohit, A. P. 2003. Pharmacognosy, Nirali Prakashan Publishers, Pune, India.

2. Singh, V. K., Govil, J. N. and Singh, G. 2002. Recent progress in Medicinal Plants: Vol 1 Ethnomedicine and Pharmacognosy. SCI Tech Publishing, LLV, USA.

3. NIIR Board of Consultants & Engineers, 2004. Drugs & Pharmaceutical: Technology and Hand book, Asia Pacific Business Press Inc. Delhi, India.