VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN [AUTONOMOUS]

An ISO 9001:2008 Certified Institution, Affiliated to Periyar University, Salem,
(Approved by AICTE and Re-Accredited with 'A' Grade by NAAC,
Recognized Under 2(f) and 12(b) of UGC Act, 1956).
Elayampalayam, Tiruchengode - 637 205, Namakkal Dt., Tamilnadu, INDIA.

DEPARTMENT OF CHEMISTRY

MASTER OF SCIENCE (M.Sc.)

VICAS

CHEMISTRY

M.Sc., CHEMISTRY
REGULATIONS AND SYLLABUS

[FOR CANDIDATES ADMITTED FROM 2018-19 ONWARDS UNDER AUTONOMOUS – OBE PATTERN]

SPONSORED BY
ANGAMMAL EDUCATIONAL TRUST
Elayampalayam – 637 205, Tiruchengode Tk., Namakkal Dt., Tamil Nadu.
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About the College

Vivekanandha College of Arts and Sciences for Women (Autonomous) was established and hailed into Women's Educational Service in the Year 1995. Angammal Educational Trust Chaired by the great Educationalist 'Vidhya Rathna' Prof. Dr. M. KARUNANITHI, B.Pharm., M.S., Ph.D., D.Litt., sponsors this college and other institutions under the name of the great Saint Vivekanandha. Our institutions are situated on either side of Tiruchengode-Namakkal Main Road at Elayampalayam, 6 kms away from Tiruchengode. This is biggest women's college in India with more than 7500 girl students and more than 18 departments. The strength of the college was just 65 at the time of its establishment. With the dedication, work, sacrifice and long vision of the chairman, this institution has grown into a Himalaya stage. As a result of which UGC, New Delhi, awarded 2f and 12b, extended Autonomous status for second cycle. The National Assessment and Accreditation Council reaccredited with grade 'A' for its successful performance.

As an Autonomous Institution, academic professionals of the college framed Curriculum and Syllabi in consultation with all its stakeholders to cater the needs of the young women to fulfill the women empowerment and present Industrial needs to the local benefits. The students are empowering with confidence and required skills to face the society.

Quality Policy

To provide professional training by establishing a high level center of learning that provides quality education at par with the international standards and Provide excellence education with well equipped infrastructure to all the rural women.

Our Vision

To be an academic institution exclusively for women, in dynamic equilibrium with the social and economic environment, strive continuously for excellence in education, research and technological service to the nation.

Our Mission

The mission of our institution is to discover, teach and apply knowledge for the intellectual, cultural, ethical, social and economic growth of women students.

REGULATIONS

I. SCOPE OF THE COURSE

The uniqueness of the M.Sc. (Chemistry) program is its content and topic coverage, the teaching methodology and the faculty. The program expects a serious commitment of the students to take up challenging study schedules and assignments. The course involves a blend of theoretical education and practical training which run concurrently for a period of three years and equips a student with knowledge, ability, skills and other qualities.

The teaching methodologies include classroom lectures, industrial visits, orientation and internship. The new syllabus may help the students to understand the newer aspects of chemistry and apply the same to the real life situations. Thus the students turn more relevant and resourceful to the society. It may enable the young minds think differently and forms a link between old ideas and new ideas in chemistry and gives comprehensive approaches to the very learning process and the learners. To have academic flexibility we have chosen and implemented Choice Based Credit System (CBCS) in our syllabus. To enhance the quality of students from 2018-2019, we have implemented Outcome Based Education (OBE) education system for I PG students. The OBE pattern will be extended for the II PG students in forth coming years.

II. SALIENT FEATURES

- Course is specially designed for a higher level career placement.
- Special guest lecturers from Industrialists will be arranged.
- Exclusively caters to students interested in pursuing higher studies.
- Special industry orientations and training are parts of the degree course.

- Project work is included in the syllabus to enhance conceptual, analytical and deductive skills.

III. OBJECTIVES

The new syllabus throws light on the recent and emerging areas of chemistry.

- ✓ Enable the students to understand chemistry and make them more relevant to the society.
- ✓ Develop the analytical ability in students so that they prepared themselves in solving problems.
- ✓ Help the students to learn practical skills in a better way.
- ✓ Inculcate research aptitude in students.
- ✓ Enable the students to go to higher levels of learning chemistry.
- ✓ Improve the employability of the students.
- ✓ To inspire the students to apply their knowledge gained for the development of society in general.

IV. ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the first year PG Degree course (M.Sc. chemistry) shall be required to have passed B.Sc., (Chemistry) B.Sc., (Applied chemistry) and B.Sc., (Industrial chemistry).

V. DURATION OF THE COURSE

- The course shall extend over a period of two academic years consisting of four semesters. Each academic year will be divided into two semesters.

The first semester will consist of the period from July to November and the second semester from December to April.

- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University.
- Each subject will have 5 and/or 4 hours of lecture per week apart from practical training at the end of academic year.

VI ASSESSMENT

Assessment of the students would be made through Continuous Internal Assessment (CIA) and External Assessment (EA) for passing each subject both theory and practical papers.

A candidate would be permitted to appear for the External Examination only on earning 75 % of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

A. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the Internal Assessment Marks will be as under:

1.	Average of two CIA test and Model exam	- 10 Marks
2.	Seminar	- 05 Marks
3.	Assignment	- 05 Marks
3.	Attendance	- 05 Marks
		.....
	Total	=25 Marks
		.....

Distribution of attendance mark

S. No.	Percentage	Marks	
		Theory	Practical
1	76-80	1	2
2	81-85	2	4
3	86-90	3	6
4	91-95	4	8
5	96-100	5	10

B. EXTERNAL ASSESSMENT (EA)

The performance of the students would be assessed by examination at the end of each semester with a written test for theory for three hours and practical examination at the end of even semesters for six hours. Question papers would be set by the selected external examiners in the prescribed format and valuated by the external examiners with the help of the teacher concern.

The pattern of assessment is as follows:

Distribution Of Final Assesment Marks (Theory-75, Practicals-60)

Section	Activity	Marks (75)	Activity	Marks (60)
A	One mark (20)	20	Record work	5
B	Five marks (Either or)	25	Viva Voce	5
C	Ten marks (3/5)	30	Spotter	20
			Major (Performance)	5

			Major (Result)	5
			Major (Writeup)	10
			Minor (Performance)	2
			Minor (Result)	3
			Minor (Writeup)	5
Total		**75**	**Total**	**60**

VII. PASSING MINIMUM

INTERNAL

There is no passing minimum for CIA

EXTERNAL

In the University Examinations, the passing minimum shall be 50 % out of 75 Marks for theory (38 marks) and 50% out of 60 marks for practical (30 Marks).

VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of Core Courses and elective courses, and securing marks

a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the programme at first appearance itself.

b) 60% and above shall be declared to have passed the examinations in first class without Distinction.

c) 50% and above but below 60% shall be declared to have passed the examinations in second class.

d) Candidates who pass all the examinations prescribed for the programme at the first appearance itself and within a period of two consecutive academic years from the year of admission only will be eligible for University rank.

IX. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than two academic years comprising of four semesters and passed the examinations prescribed and fulfiled such conditions have been prescribed.

X. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the end semester examination in the concerned subject in subsequent semesters and shall pass the examination.

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2017-18 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2017-18 and thereafter.

XII. COURSE PATTERN (OBE)

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(AUTONOMOUS)

SYLLABUS FRAME WORK

Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks	Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks
YEAR I													
Semester I							**Semester II**						
Organic Chemistry-I & 18P1CH01	4	5	3	25	75	100	Organic Chemistry-II & 18P2CH04	5	5	3	25	75	100
Inorganic Chemistry-I & 18P1CH02	4	5	3	25	75	100	Inorganic Chemistry-II & 18P2CH05	5	5	3	25	75	100
Physical Chemistry-I & 18P1CH03	4	5	3	25	75	100	Electrochemistry and Photochemistry & 18P2CHE02	5	4	3	25	75	100
Nano chemistry & 18P1CHE01	4	4	3	25	75	100	Organic Chemistry Practical-I & 18P2CHCP01	5	4	6	40	60	100
Organic Chemistry Practical-I & 18P2CHCP01	4	-	6	-	-	-	Inorganic Chemistry-Practical-I & 18P2CHCP02	5	4	6	40	60	100
Inorganic Chemistry-Practical-I & 18P2CHCP02	5	-	6	-	-	-	Physical Chemistry-Practical-I & 18P2CHCP03	4	4	6	40	60	100
Physical Chemistry-Practical-I & 18P2CHCP03	4	-	6	-	-	-	Library	1	-	-	-	-	-
Library	1	-	-	-	-	-		-	-	-	-	-	-
Total	**30**	**19**	**12**	**100**	**300**	**400**	**Total**	**30**	**26**	**21**	**195**	**405**	**600**
							I YEAR TOTAL		**45**	**33**	**295**	**705**	**1000**
YEAR II													
Semester III							**Semester IV**						
Organic Chemistry-III & 18P3CH06	5	5	3	25	75	100	Physical Chemistry-III & 18P4CH09	5	5	3	25	75	100
Inorganic Chemistry-III & 18P3CH07	5	5	3	25	75	100	Environmental chemistry & 18P4CHE03	5	4	3	25	75	100
Physical Chemistry-II & 18P3CH08	5	5	3	25	75	100	Organic Chemistry Practical-II & 18P4CHCP04	5	4	6	40	60	100
Solar Energy & 18P3PHED01	4	4	3	25	75	100	Inorganic Chemistry-Practical-II & 18P4CHP05	5	4	6	40	60	100
Organic Chemistry Practical-II & 18P4CHCP04	5	-	-	-	-	-	Library	1	-	-	-	-	-
Inorganic Chemistry-Practical-II & 18P4CHP05	5	-	-	-	-	-	Project Work	8	9	3	60	140	200
Human Rights & 18P3HR01	1	1	3	25	75	100							

Total	**30**	**20**	**15**	**125**	**375**	**500**	**Total**	**30**	**26**	**21**	**190**	**410**	**600**
II YEAR TOTAL									**46**	**36**	**315**	**785**	**1100**
TOTAL CREDIT FOR THE COURSE									**91**	**69**	**610**	**1490**	**2100**

Distribution Of Duration And Credit Under Different Papers

Part	Paper	Hours/Week	Weeks/Semester	Hour/Paper	No. of Papers	Credit/Paper	Total Hours	Total credit
I	**Core paper**	5	15	75	9	5	675	45
I	**Core practical**	5	15	150	5	4	750	20
II	**Elective**	4	15	60	3	4	180	12
II	**EDC**	4	15	60	1	4	60	4
-	**Human Rights**	1	15	15	1	1	15	1
-	**Project Work**	1	15	15	1	9	15	9
TOTAL CREDIT								**91**

XIII . BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory: 75 Marks

(i)Test - I & II and ESE:

Knowledge Level	Section	Marks	Description	Total
K1	A (One Mark)	20 x 01=20	Objective	**75**
K2	B (Either or pattern)	05 x 05=25	Descriptive	
K3, K4 & K5	C (Three out of five)	03 x 10=30	Detailed	

Programme Outcomes

P01: Knowledge of science: Apply the knowledge of mathematics, physics and chemistry fundamentals to understand the emerging problems and to find solutions.

P02: Problem analysis: Identify, formulate, research literature, and analyze complex problems reaching substantiated conclusions using first principles of mathematical, biological, physical and chemical sciences.

PO3: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

P04: To make the students to meet the needs of the region to have an edge to compete globally with the adequate knowledge in basic science.

Programme Specific Outcomes

On successful completion of this Programme, students will have the ability to:

PS01: learn the advanced concepts of chemistry.

PS02: able to predict the kinetics and mechanism of chemical reactions.

PS03: able to elucidate the structure and energy of compounds.

PS04: think critically and analyse the chemical problems.

PS05: apply modern methods of analysis to chemical systems.

PS06: able to synthesize and characterize the chemical products.

Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P3CH06	Title	Batch	2018-2020
		Core VI – Organic Chemistry-III	Semester	III
Hrs/Week	5		Credits	05

Course Objective

To enable student to learn about the chemistry of natural products.

To learn the concepts of pericyclic reactions.

To learn the relation between the structure and physiological properties of chemicals.

To learn the basic principles and various method of green synthesis in organic chemistry.

Course Outcomes (CO)

K1	CO1	Students can learn about the chemical properties and structure of organic compounds like terpenoids, alkaloids, steroids and flavones etc derived from plant materials.
K2	CO2	Students can understand isolation, characterisation and laboratory synthesis of natural products.
K3	CO3	Student can know the concept of HOMO and LUMO, and their influence in bond formation.
K4	CO4	Students study the nature of double bonded compounds and the possible isomer arrived upon their rearrangement.
K5	CO5	Knowledge of student will be enriched with green chemistry and various types of eco-friendly reactions could be conducted on their own.

UNIT – I Terpenoids and Alkaloids (15 Hours)

Terpenoids: Clasification-General structural elucidation. Structural elucidation and synthesis of α-Pinene, Camphor, Zingiberene and Juvenile hormone.

Alkaloids: Clasification-General structural elucidation. Structural elucidation and synthesis of Reserpine, Morphine, Quinine, Cinchonine and Papaverine.

SELF STUDY: Biological role of alkaloids in human activity.

PRACTICAL WORK: Determination of functional group in Terpenoids and Alkaloids

UNIT – II Steroids, Flavones and Vitamins (15 Hours)

Steroids: Classification – structural elucidation and synthesis of Cholesterol, Estrone, progesterone, Stigmasterol.

Flavones: Introduction- Baker-Venkataraman rearrangement-Kostanecki synthesis of flavones-Flavonol; Synthesis of Quercetin-Isoflavones; Daidzein.

Vitamins: Physiological importance, Structural elucidation of B_6, B_{12}, and K.

SELF STUDY: Physiological importance of steroids and flavones

PRACTICAL WORK: Extraction and estimation of vitamins.

UNIT – III Pericyclic reactions (15 Hours)

Concerted reactions-Stereochemistry-orbital symmetry and correlation diagram – Frontier Molecular Orbital approach – Woodward and Hoffman rules – Electrocyclic reactions – cycloaddition- selection rule-sigmatropic rearrangements- selection rules with simple examples – 1,3 and 1,5 –hydrogen shifts – Cope and Claisen rearrangement.

SELF STUDY: Types of pericyclic reactions, Basic requirements of pericyclic reactions.

PRACTICAL WORK: Prepare a chart for Woodward-Hoffman rules.

UNIT – IV Anthocyanins, Purines and Nucleic acids (15 Hours)

Introduction to anthocyanins – Synthesis of anthocyanins. Structure and biological applications - Uric acid, Purine derivatives and Xanthine bases.

Nucleic acids – Synthesis of Nucleosides (Purines-Adenine, Guanine; Pyrimidines-Uracil, Thymine, Cytosine). Synthesis of Nucleotides – adenosine-5'-phosphate.

SELF STUDY: Natural source of anthocyanins.

PRACTICAL WORK: Chromatographic studies of nucleic acids

UNIT – V Green synthesis (15 Hours)

Principles of Green chemistry, Synthesis in water-Pericyclic reaction-Wittig-Horner reaction, Strecker synthesis-Synthesis in super critical Carbondioxide-Freidal crafts reaction, Hydroformylation reaction. Types and preparation of ionic liquids, synthesis using ionic liquids-Claisen-Schmidt Condensation-Polymer supported green reagent-PNBS, Synthesis using PTC-mechanism, types, advantages and applications of PTC, Microwave induced Green synthesis-Comparison of reactions in water and organic solvents.

SELF STUDY: Basic principles of microwave, sonochemical synthesis.

PRACTICAL WORK: Carry out a green synthesis with water and solid supported reagents.

CONTENT BEYOND THE SYLLABUS

1. Classification and medicinal applications of terpenoids and alkaloids.
2. Synthetic route of a molecule of your choice.
3. Elucidate structure of a molecule of your choice.
4. Influence of 1,3 and 1,5 –hydrogen shifts in sigmatropic rearrangements.
5. Identify green reactions and their advantages.

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1. V.K.Ahluwalia,M.Kidwai,New trends in green chemistry,Second Edition,2007.
2. Arun Bahl and B.S.Bahl,Advaced organic chemistry,S.Chand and company,2009.
3. T.W.Graham salomons, Carig B.Fryhle,Organic chemistry,9th edition,Wiley.2011.

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1. https://articles.mercola.com/sites/articles/archive/2017/08/28/terpenoids.aspx
2. https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/pericycl.htm
3. https://lpi.oregonstate.edu/mic/dietary-factors/phytochemicals/flavonoids
4. www.essentialchemicalindustry.org/processes/green-chemistry.html

Mapping

PSO / CO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	VS	S	S	W	S	VW
CO2	S	VS	S	S	VS	VS
CO3	VS	W	S	VW	S	S
CO4	S	VS	VS	W	W	VW
CO5	S	VS	S	VW	W	S

VS-Very strong; S-Strong; W-Weak; VW-Very weak

Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P3CH07	Title	Batch	2018-2020
		Core VII – Inorganic Chemistry-III	Semester	III
Hrs/Week	5		Credits	05

Course Objective

1. To gain knowledge about non aqueous solvents, cages ,chains and clusters.
2. To learn elaborately in the field of solid state and bio-inorganic chemistry.
3. To understand the working and application of various analytical tools to deduce crystal structure of solids.

Course Outcomes (CO)

K1	CO1	Students have the knowledge of application and properties of non aqueous solvents and formation of liquid and gaseous molecules.
K2	CO2	Students can able understand the commercial application of inorganic molecule such as silicates , Zeolites, Ultramarine and silicones
K3	CO3	Students are enable to understand the basic of crystal structure, application of the analytical tools like XRD, AAS and PES tools in elucidating three dimensional structure of the inorganic molecules.
K4	CO4	Students can know the importance of biologically important materials in our body.
K5	CO5	Students will have enriched knowledge on porphyrin and other bioinorganic molecules

Unit – I: Non-aqueous solvents (15 Hours)

Classification of non aqueous solvents- Solute-Solvent interactions- Reactions in liquid ammonia- metals in liquid ammonia- Reactions in anhydrous sulphuric acid, liquid sulphur dioxide, liquid HF and liquid, dinitrogen tetroxide. Distribution law, extraction process, liquid - liquid extraction, extractants, factors affecting extraction, technique for solvent extraction, quantitative treatment of solvent extraction equilibria, Classification of solvent extraction systems, Transition of a substance from an aqueous phase.

SELF STUDY: Influence of Non-ionizing non-aqueous solvents on acids

PRACTICAL WORK: Comparisons of acidity and basicity between solvents

Unit – II: Inorganic chains, rings, cages and clusters (15 Hours)

Silicate minerals – ortho-, pyro-, and meta-silicates – pyroxene, amphiboles – two-dimensional silicates – talc, mica and three dimensional aluminosilicates, zeolites.

Silicones-preparation, properties and uses - Iso and hetero-polyacids - Structures of $[TeMo_6O_{24}]^{6-}$ and $[Mo_7O_{24}]^{6-}$ ions and $[PMo_{12}O_{40}]^{3-}$ ion – Polymeric sulphur nitride – borazines, phosphonitrilic compounds-trimers and tetramers - homocyclic inorganic ring systems – Concept of multi-centered bond – structure of B_2H_6, B_4H_{10}, $[B_{12}H_{12}]^{2-}$, B_6H_{10}, Wade's rules, closo, nido, arachno boranes and carboranes and "styx" code.

SELF STUDY: Identification of boranes and carboranes using Wade-Mingo's rule.

PRACTICAL WORK: Application of sulphur nitrides in soalr cells and LED.

Unit – III: Solid State Chemistry (15 Hours)

Space lattice - unit cell- crystal systems- elements of symmetry- space groups-Miller indices- crystal analysis- XRD - rotating crystal method- powder method - packing of atoms and ions in solids- Electrical properties of solids – Band theory, semiconductors, super conductors, theory of super conductivity – defects in solids - solid state electrolytes; magnetic properties of solids – dia, para, ferro, antiferro and ferrimagnetism; hysterisis; Optical properties – solid – state lasers and Inorganic phosphors. Reactions in solid state and phase transitions – diffusion coefficient, diffusion mechanism, vacancy and interstitial diffusions, formation of spinels and inverse spinels; solid solutions.

SELF STUDY: Discuss the types and structure of Bravis Lattices

PRACTICAL WORK: Identify spinels and inverse spinels using CFSE.

Unit – IV: Atomic absorption, emission spectroscopy and Crystal Studies (15 Hours)

Atomic absorption spectroscopy and flame emission spectroscopy: Basic principles - flame characteristics - atomizers and burners- interference instrumentation and applications of AAS and FES. PES –theory of XPS, UPES-evaluation of ionization potential-chemical identification of elements – ESCA - Koopmann's theorem-chemical shift - UPES, XPS of N_2, O_2, and HCl-evaluation of vibration constants from UPES-spin orbit coupling.

SELF STUDY: Comparison between absorption and emission spectroscopy

PRACTICAL WORK: Application of AAS in food Industry

UNIT – V: Bio-inorganic Chemistry (15 Hours)

Porphyrin ring system - Metalloporphyrins - Haemoglobin and Myoglobin-structures and work functions - other oxygen carriers - Cytochromes: Structure and work functions in respiration - Chlorophyll, structure - photo synthetic sequence - Sulphur proteins - (Non -Haemo iron protein) - Copper oxidizes - Blue copper proteins - Carboxyl

peptidase A: Structure, function - Carbonic anhydrase: Inhibition and Poisoning - Corrin ring system - Vitamin B_{12}, In vivo and in vitro nitrogen fixation - Molecular mechanism of ion transport across the membrane - Na and K ion pumps-Chelate therapy-cis-platin.

SELF STUDY: Compare Haemoglobin and Myoglobin.

PRACTICAL WORK: Chlorophyll separation from different types of plants

CONTENT BEYOND THE SYLLABUS

1. Nonaqueous solvent as a medium to conduct organic reactions.
2. Application of silicates, silicones and zeolites ,felspar,aluminosilicates in the field of medicine.
3. Minerals present in the human body.
4. Applications of different MEMBRANES USED IN AAS.
5. Solid state chemistry in human welfare.

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2. F. A. Cotton, G. Wilkinson., Advanced Inorganic Chemistry, 3rd Edn, John Wiley & Sons, Inc (1972).
3. G. Raj., Advanced Inorganic Chemistry Vol. I & Vol. II, 6th Edn, Goel publishing house (1999).
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Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	S	VS	VS	VW	W	VS
CO2	S	VW	VS	S	VS	VW
CO3	S	W	VS	W	VS	VS
CO4	VS	VS	VS	W	VW	W
CO5	VS	VS	S	W	W	VS

VS-Very strong; S-Strong; W-Weak; VW-Very weak

Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P3CH08	Title	Batch	2018-2020
		Core VIII- Physical Chemistry - II	Semester	III
Hrs/Week	5		Credits	05

Course Objective

1. To impart knowledge in the field of Quantum chemistry, Thermodynamics and Spectroscopy.
2. To make the students to understand the principles of vibrational and rotational spectroscopy.
3.

Course Outcomes (CO)

K1	CO1	Students will be able to identify wave functions using operators and recognize functions and values.
K2	CO2	Students will learn to perturbation and variation.
K3	CO3	Students can learn the concept of chemical potential, fugacity of gases, Activity and activity coefficient
K4	CO4	Students will learn about Electromagnetic radiation, Rotational, vibrational, and electronic transitions in molecules.
K5	CO5	Students can understand the importance, applications and basic aspects of Vibrational Spectroscopy.

Unit I: Quantum Chemistry-I (15Hours)

Quantum theory: Inadequacy of classical mechanics - Black body radiation - Born's interpretation of wave function - Operators: Commutator - Linear operators and Hermitian operator- Eigen functions and Eigen values - Hamiltonian operator - Postulates of quantum mechanics - Schrodinger equation and its solution to the problem to a particle moving in one dimensional box and three dimensional box - Rigid rotor - Simple harmonic oscillator - Schrodinger equation for the H-atom.

SELF STUDY: Photoelectric effect, Dual character of electron.

PRACTICAL WORK: Prepare a schematic representation of SHO and rigid rotor.

UNIT-II: Quantum Chemistry-II (15 Hours)

Approximation methods : Perturbation and variation methods - application to ground state energy of hydrogen and helium atom - self consistent field approximation -

Hartree and Hartree-Fock's SCF method - VB and MO theory-application to hydrogen molecule – Huckel's MO theory – Application to ethylene and benzene.

SELF STUDY: Stark effect on the first excited state of hydrogen atom.

PRACTICAL WORK: Prepare a chart to compare Huckel model of ethylene and benzene.

Unit-III: Thermodynamics-I (15 Hours)

Thermodynamics of non-ideal systems - Concept of chemical potential - Gibbs-Duhem equation - Variation of chemical potential with temperature and pressure - Concept of fugacity of gases - Determination by graphical method and from equation of state - Variation of fugacity with temperature and pressure - Fugacity coefficient - Activity and activity coefficient - Variation of activity of a gas with pressure and temperature. Determination of solvent activity by vapour pressure method and Cryoscopic method.

SELF STUDY: Relation between fugacity and activity coefficient.

PRACTICAL WORK: Experimental determination of solvent activity by cryoscopic method.

Unit-IV: Microwave spectra (15 Hours)

Introduction: Electromagnetic radiation, Interaction of light with matter, mechanism of absorption & emission of radiation. Rotational, vibrational, and electronic transitions in molecules; regions and representation of spectra.

Micro wave Spectroscopy: Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines, selection rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors. Rotational spectra of polyatomic molecules.

SELF STUDY: Classical and Quantum mechanics of Micro wave Rotational Spectroscopy.

PRACTICAL WORK: Prepare a model to show the rotational modes in microwave spectra.

Unit-V: Vibrational Spectra (15 Hours)

Vibrational Spectroscopy: Vibrating diatomic molecule: energy of diatomic molecules as simple harmonic and Unharmonic oscillator - energy levels, vibrational transitions, selection rules; Diatomic vibrating rotator: Born-Oppenheimer approximation, vibration-rotational spectra, selection rules; P, Q, R branches. Vibrations of polyatomic molecules: fundamental vibrations and its symmetry, normal modes of vibration, overtones and combination of bands.

Raman Effect: Rayleigh and Raman scattering, Stokes and anti-Stokes lines, molecular polarizability, Raman selection rules. Raman spectra: rotational Raman spectra-

linear molecules, symmetric top and spherical top molecules; vibrational Raman spectra-symmetry and Raman active vibrations, rule of mutual exclusion.

SELF STUDY: Instrumentation of Raman spectroscopy

PRACTICAL WORK: Synthesize and study the vibrational spectra of any one molecule.

CONTENT BEYOND THE SYLLABUS

1. Superiority of Quantum chemistry over classical mechanics.
2. Approximation methods in arriving hybridization of smaller molecules.
3. Non-ideal systems in pressure and temperature dependant reactions.
4. Electromagnetic radiations- application and associated physical events..
5. Complementary role of Raman spectra to IR spectra.

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1. R. K. Prasad., Quantum Chemistry, Viva Books Private Ltd (2013).
2. D. McQuarrie., Quantum Chemistry, Viva Books Private Limited (2013).
3. A. K. Chandra., Introductory Quantum Chemistry, Tata McGraw Hill (1994).
4. W. J. Moore., Physical Chemistry, Longmann's (1975).
5. C. N. Banwell and E. M. McCash., Fundamentals of Molecular Spectroscopy, 4th Edn, Tata McGraw Hill, (2010).
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7. B. K. Sen., Quantum Chemistry Including Spectroscopy, Kalyani publishers (2004).
8. S. Glasstone., Thermodynamics for Chemists - East-west Press Pvt.Ltd, (2002).
9. Jag Mohan., Organic Spectroscopy - Principles and Applications, CRC press (2004).

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1. Arun Bahl, B. S.Bahl, G. D.Tuli., Essentials of Physical Chemistry, Multicolour Revised Edn, S.Chand and Company Ltd, (2008).
2. Y. R. Sharma., Elementary Organic Spectroscopy, Chand Publications (2007).
3. R. Chang., Basic principles of Spectroscopy, McGraw-Hill Inc.,US (1971).
4. Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014).

ONLINE SOURCES

1. www.chemistryexplained.com
2. http://unicorn.mcmaster.ca/teaching/4PB3/SymmetryLectureNotes2009-Vallance-Oxford-level2.pdf

3. http://cbc.arizona.edu/~salzmanr/480a/480ants/kinintro/kinintro.html
4. http://nptel.ac.in/courses/122101001

Mapping

PSO / CO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	S	S	VS	VS	W	VS
CO2	S	VS	VW	W	VW	VS
CO3	S	VW	VS	VS	W	VS
CO4	VS	VS	W	VW	S	S
CO5	VS	VS	S	W	W	VS

VS-Very strong; S-Strong; W-Weak; VW-Very weak

Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P3CHED01	Title	Batch	2018-2020
		Elective Paper - III	Semester	III
Hrs/Week	5	APPLIED POLYMER CHEMISTRY	Credits	04

Course Objective

1. To impart the knowledge in the field of polymer chemistry.
2. To acquire knowledge in the preparation methods of addition polymers.
3. To impart knowledge in the preparation of syndiotactic, atactic and isotactic polymers using Zeiler-Natta catalyst.
4. To impart understanding in the field of processing of polymers.
5. To explore the applications of various synthetic polymers.

Course Outcomes (CO)

K1	CO1	Students enable to understand various methods of polymer preparation.
K2	CO2	Acquire knowledge about types of polymers and processing techniques.
K3	CO3	Students know Molecular weight determination of polymers.
K4	CO4	Students will analyze the various processing of polymers
K5	CO5	Students enable to understand importance of polymers used for commercial applications.

UNIT I: Basic Concepts (15 Hours)

Monomers, degree of polymerization, Linear, branched and network Polymers. Addition polymerization: Mechanism of Free radical, cationic and anionic polymerization. Condensation Polymerization in homogeneous and heterogeneous systems.

SELF STUDY: Classification of polymers

PRACTICAL WORK: Synthesis of Polyethylene using Radical polymerisation

UNIT II: Co-ordination and co-polymerization (15 Hours)

Kinetics, mono and bimetallic mechanism of co-ordination polymers. Advantages of Zeigler-Natta catalyst. Co-polymerization: Block and graft co-polymers, kinetics of copolymerization. Types of co-polymerization. Reactivity ratio. Cross-linked polymers and their applications.

SELF STUDY: Study the types of coordination polymerization

PRACTICAL WORK: Calculation of reactivity ratio using Mayo–Lewis equation

UNIT III: Molecular Weight and Properties (15 Hours)

Polydispersion–average molecular weight concept, number, weight and viscosity average molecular weights. Measurement of molecular weights- Viscosity, light scattering, osmotic and ultracentrifugation methods. Polymer structure and physical properties–crystalline melting point T_m. Glass transition temperature (T_g), Determination of T_g. Relationship between T_m and T_g.

SELF STUDY: Study of tensile Strength and Elongation property of polymers

PRACTICAL WORK: Determination of Glass transition temperature for various polymers

UNIT IV: Polymer Processing (15 Hours)

Plastics, elastomers and fibres. Compounding, processing techniques: calendering, die casting, rotational casting, film casting, injection moulding, blow moulding extrusion, moulding, thermoforming, foaming, reinforcing and fibre spinning.

SELF STUDY: Compounding technique by extrusion method

PRACTICAL WORK: List out the major problems involved in Polymer Processing

UNIT V: Preparation and applications of Commercial Polymers (15 Hours)

Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers, Fire retarding polymers and electrically conducting polymers. Biomedical polymers–contact lens, dental polymers, artificial heart, kidney, skin and blood cells.

SELF STUDY: Discuss the preparation and application of polystyrene

PRACTICAL WORK: Polymers in Road construction

CONTENT BEYOND THE SYLLABUS

1. Cross linked polymers and their commercial applications.
2. Green polymer processing techniques.
3. Biodegradable polymers in the place of artificial polymers.

REFERENCES

1. F.W. Billmeyer, Text Book of Polymer Science, 3rd Edition, J.Wiley, (2003).
2. H.R. Alcock and F.W. Lamber, Contemporary Polymer Chemistry, Prentice Hall, (1981).
3. P.J. Flory, Principles of Polymer Chemistry, Cornell University press, New York, (1953).

4. G. Odian, Principles of Polymerization, 2nd Edition, John Wiley & Sons, New York, (1981).

TEXT BOOKS

1. V. R. Gowariker, N.V. Viswanathan and J. Sreedhar, Polymer Science, New Age Int., (1986).

ONLINE SOURCES

1. http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch8/vsepr.html
2. https://chem.libretexts.org
3. http://www.chem.iitb.ac.in/people/Faculty/prof/pdfs/L5.pdf

Mapping

PSO / CO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	VS	S	VS	S	VW	VS
CO2	W	VW	VS	VW	W	VW
CO3	VS	S	VW	VS	VS	W
CO4	S	S	W	VS	S	S
CO5	W	W	VS	W	S	VS

VS-Very strong; S-Strong; W-Weak; VW-Very weak

Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P4CH09	Title	Batch	2018-2020
		Core IX –	Semester	IV
Hrs/Week	5	PHYSICAL CHEMISTRY-III	Credits	05

Course Objective

1. To enable the students to acquire knowledge on statistical thermodynamics.
2. To understand the difference between classical and statistical thermodynamics.
3. To acquire knowledge in the field of UV-Vis spectroscopy and its application to organic molecules.
4. To impart knowledge in the field of various spectroscopic techniques like NMR, NQR, MASS, and ESR and their applications in the characterization of molecules.

Course Outcomes (CO)

K1	CO1	Students will learn the Objectives and various functions of Statistical thermodynamics.
K2	CO2	Students acquire deep knowledge about the concept of non equilibrium and applications
K3	CO3	Students will learn about the theory of UV-spectroscopy, Fluorescence Spectroscopy and its applications
K4	CO4	Students will analyze theory and applications of NMR and EPR spectroscopy
K5	CO5	Students will evaluate the molecular weight of the organic compounds

Unit-I: Statistical Thermodynamics (15 Hours)

Objectives of Statistical thermodynamics – concept of thermodynamically and mathematical probabilities – Distribution of distinguishable and non – distinguishable particles. Maxwell – Boltzmann, Bose – Einstein and Fermi – Dirac statistics Law – comparison and its applications. Partition Function – evolution of Translational, Vibrational, Rotational and Electronic partition Functions – Thermodynamic Functions in terms of partition Function – Statistical expression for equilibrium constant – Calculation of Equilibrium constant from partition Function. Heat capacities of solids - Einstein's and Debye's theories of heat capacities of solids.

SELF STUDY: Fundamentals of classical and statistical thermodynamics.

PRACTICAL WORK: Statistical Thermodynamics of Iodine Sublimation

Unit-II: Non-Equilibrium Thermodynamics (15 Hours)

Non-Equilibrium - its postulates- Entropy production-Entropy production in heat flow and matter flow. Forces and fluxes-Flows and coupled flows-Linear laws-Phenomenological law-Onsager reciprocal relation-Proof by Microscopic reversibility-Verification by Electro-kinetic phenomenon-Diffusion. Non-Equilibrium stationary states-Applications of non-equilibrium thermodynamics.

SELF STUDY: Flow of heat in a matter.

PRACTICAL WORK: Study of non equilibrium materials using diffusion phenomena.

Unit-III: UV and fluorescence Spectroscopy (15 Hours)

UV-spectroscopy: Theory - Instrumentation-Beer-Lamberts Law - bands in UV-VIS spectrum - Possible electronic transitions - Types of electronic transitions based on selection rules - Characteristic absorption (λmax and εmax) of carbonyl - Isolated double bond - Conjugated double bond systems and aryl groups - Factors influencing the absorption - Spectroscopic terms: Chromophore - Auxochrome - Bathochromic shift - Hypsochromic shift - Hypochromic shift - Hyperchromic shift – applications.

Fluorescence Spectroscopy: Primciples, Instrumentation and applications.

SELF STUDY: Woodward-Fieser rules for calculating absorption maximum for Diene and Triene

PRACTICAL WORK: Calculate the absorption maximum for 2,4 hexadiene and 2,3 dimethylene bicyclo [2,2,1] heptanes.

Unit-IV: NMR and ESR Spectroscopy (15 Hours)

NMR Spectra: Theory of nuclear resonance - Instrumentation - Chemical shift - Factors influencing chemical shift - Shielding and deshielding mechanisms - Spin-spin coupling - Coupling constant - Nuclear overhauser effect - Applications of NMR spectra to simple organic molecules - Introduction to13C NMR, 19F NMR, 31P NMR.

ESR Spectroscopy: Theory - derivative curves - 'g' values - Hyperfine splitting - Isotropic and anisotropic systems - Applications of ESR.

SELF STUDY: Study the PMR spectra of the following compounds: Benzene,Toluene,Ethyl benzene,ISopropylbromideAcetaldehyde,Acetic acid,Acetophenone,Methylpropionate

PRACTICAL WORK: Determine the structure of an organic molecule using NMR

Unit-V: Mass and Mossbauer Spectroscopy (15 Hours)

Mass Spectroscopy: Theory - Instrumentation - Types of ions: Molecular ion - Fragment ion rearrangement ion - Metastable ion - odd & even ions - Molecular ion peak - Base peak - Metastable ion peak - Determination of molecular formula - Nitrogen rule and ring rule - Isotopic abundance analysis - Fragmentation process: Retro Diels-Alder rearrangement - Mclattery rearrangement - Double bond and ring equivalence - Fragmentation of organic compounds with respect to their structural determination (alcohol, hydrocarbon, carbonyl compounds and nitro compounds).

Mossbauer Spectroscopy: Line width - Isomer shift - Quadrupole interactions - Magnetic interactions - Mossbauer emission spectroscopy - Structural elucidation of iron and tin complexes.

SELF STUDY: Basic principle of Mass and Mossbauer spectroscopy

PRACTICAL WORK: Prepare a chart on Fragmentation pattern any two organic molecules.

CONTENT BEYOND THE SYLLABUS

1.Application of distribution law and approximations

2.Classical and Statistical thermodynamics advantages.

3.Application of spectroscopic techniques.

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1. S. Glasstone, Thermodynamics for Chemistry, Read Books (2007).
2. P.W. Atkins., Physical Chemistry, 6th Edn, Oxford University Press, (1998).
3. M.C. Gupta., Statistical Thermodynamics, Wiley Eastern Limited (1990).
4. B.R. Puri, L. R. Sharma, M. S. Pathania., Principles of Physical Chemistry, Vishal Publishing Co. (2016).
5. P. S. Kalsi., Spectroscopy of Organic Compounds, New Age International (2007).

TEXT BOOKS

1. Y. R. Sharma., Elementary Organic Spectroscopy, Chand Publications (2007).
2. Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014).
3. L. K. Nash., Chemical Thermodynamics, 2nd Edn, Addision Wesley Publishing (1976).
4. Jag Mohan., Organic Spectroscopy - Principles and Applications, CRC press (2004).
5. D.N. Sathyanarayana., Introduction to Magnetic resonance Spectroscopy, IK International Publishing House Pvt. Ltd., (2013).

ONLINE SOURCES

1. nptel.ac.in/courses/103103033/module9/lecture1.pdf
2. http://folk.ntnu.no/fredrol/Nanomaterials%20and%20Nanochemistry.pdf
3. https://www.ceitec.eu/nanoparticles-for-biomedical-applications/f33079
4. https://chem.libretexts.org/

Mapping

PSO / CO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	VS	VS	S	S	VS	VS
CO2	VS	VW	VS	VW	S	W
CO3	S	VS	W	VS	VS	VS
CO4	S	S	VS	VS	W	S
CO5	VW	VW	VW	S	S	VW

VS-Very strong; S-Strong; W-Weak; VW-Very weak

Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P4CHE03	Title	Batch	2018-2020
		Elective IV- **ENVIRONMENTAL CHEMISTRY**	Semester	IV
Hrs/Week	5		Credits	04

Course Objective

1. To impart knowledge in the field of environment and pollution.
2. To acquire knowledge on the structure of atmosphere.
3. To impart knowledge on water quality and water treatment.
4. To impart knowledge in the field of industrial, agricultural pollutants and waste management.

Course Outcomes (CO)

K1	CO1	Students will acquire sound knowledge of environmental chemistry
K2	CO2	Students learn the importance of water management
K3	CO3	Students will acquire knowledge about pollution from industries
K4	CO4	Students will acquire knowledge about pollution from agricultural wastes
K5	CO5	Students will evaluate the waste management

UNIT -I : FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY (15 Hours)

Concept of environmental chemistry, Composition of atmosphere, vertical temperature and vertical structure of the atmosphere, Hydrological cycle, carbon and nitrogen cycle, Environmental pollution, air, water and soil pollution. Prevention and control of pollutions. Biogeochemical cycles in environment, Biological control of chemical factors in the environment.

SELF STUDY: Discuss the Noise pollution and its effect

PRACTICAL WORK: Marine pollution-Case study

UNIT- II : WATER CHEMISTRY (15 Hours)

Characteristics of water, Quality of natural water, quality requirements of portable water, organic, humic and colloidal material in water, chemical composition of water bodies, Commercial water purification method- reverse osmosis method-disinfection of water- purification method of water for industrial purpose (lime-soda process, ion exchange process, zeolite process). Water pollution and its environmental impact, eutrophication, concept of TDS, DO, BOD, COD.

SELF STUDY: Electrodialysis method

PRACTICAL WORK: Prepare a chart on International standards for Drinking water

UNIT -III : POLLUTANTS FROM INDUSTRY (15 Hours)

Polymers and Plastics: – The classification – The characteristics – Environmental Implications of polymers and plastics – abatement procedures for polymers and plastics pollution.

Asbestos: Structural characteristics of Asbestos – applications of asbestos – sources of asbestos in the environment – analysis of asbestos – effects of asbestos pollution – Mitigation of asbestos pollution.

Polychlorinated Biphenyls: The need – Fate of poly chlorinated Biphenyls in the Environment – Environmental Implications of Polychlorinated Biphenyls – Abatement procedures for poly chlorinated Biphenyls pollution.

SELF STUDY: Study on pollutants from cement Industry

PRACTICAL WORK: Tabulate the health effect of various industries near Thiruchengode

UNIT- IV : POLLUTANTS FROM AGRICULTURE (15 Hours)

Fertilizers: The classification – Environmental implications of fertilizers – Abatement procedures for fertilizers pollution – Eutrophication.

Insecticides: The classification – The characteristics –Environmental implications of insecticides – Abatement procedures for insecticides pollution – Bhopal Episode.

Fungicides and Herbicides: The need – The classification – The characteristics – Environmental Implications of Fungicides and Herbicides – Abatement procedures for fungicides and Herbicides pollution.

SELF STUDY: Classification and characteristics of pesticides

PRACTICAL WORK: Soil testing analysis in our college

UNIT- V : WASTE MANAGEMENT AND RECYCLING (15 Hours)

Waste management – Land filling – Incineration – Disposal of medicinal waste – New technique to treat industrial and farm effluents – Reduce, reuse and recycle – Wealth from waste (recycling) – Recycling technique – Utilizing agricultural waste – Waste into energy – Municipal waste into road making – Electricity from tannery waste – Plastic

recycling techniques – Waste water and its treatment(recycling of sewage) – Removal of hazardous wastes from contaminated metals.

SELF STUDY: Disposal of solid waste by Digestion and Dumping

PRACTICAL WORK: Qualitative and quantitative analysis of waste water from our Institution

REFERENCES

1. De, A.K., Environmental Chemistry, New Age International Publishers Private Ltd., New Delhi, Fifth Edition, 2008.
2. Sodhi, G.S., Fundamantal Concepts of Environmental Chemistry, Narosa Publishing House Pvt. Ltd., New Delhi, Third Edition, 2009.
3. J.Rose Gordon and Breach (Ed.), Environmental Toxicology, Science Publication, New York, 1993.
4. S.Ladsberger and Creatchman (Ed.), Elemental Analysis of Airborne Particles, Gordon and Breach Science Publication New York, 1998.
5. S.M. Khopkar, Environmental Pollution analysis, Wiley Eastern, New Delhi, 1994.

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1. Sharma and Kaur, Environmental Chemistry, Krishna Publishers, New Delhi, 2000.
2. Dara, S.S., Environmental Pollution and Control, S.Chand & Co., New Delhi, First Edition, 1993.
3. S.E Manahan, Environmental Chemistry, Lewis Publishers, London, 2001.
4. S.K. Banerji, Environmental Chemistry, Prentice Hall of India, New Delhi, 2003.
5. B.K.Sharma, Environmental Chemistry, Goel publishing house, Meerut, Seventh Revised, 2003

CONTENT BEYOND THE SYLLABUS

1. New sources of water.
2. Water management.
3. Prevention of pollution.

ONLINE SOURCES

1. www.purdueglobal.edu/degree-programs/legal-studies/bachelor-environmental-policy-management
2. www.onlinecolleges.net/degrees/environmental-science
3. www.forbes.com/colleges/suny-college-of-environmental-science-and-forestry

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	S	VS	VS	S	VS	VS
CO2	VS	W	S	VW	S	VS
CO3	VS	VS	VS	S	VW	W
CO4	VW	VW	W	VS	W	S
CO5	W	S	VW	VW	W	VW

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Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P4CHP04	Title	Batch	2018-2020
		CORE PRACTICAL – IV	Semester	IV
Hrs/Week	5	ORGANIC CHEMISTRY PRACTICAL– II	Credits	04

Course Objective

1. The objective of this lab is to provide hands-on training to estimate organic compounds.
2. It also gives an idea to sort out a suitable method to estimate organic compounds of their interest.
3. To train the students to conduct two stage preparations.

Course Outcomes (CO)

K1	CO1	Students can able to estimate quantitatively the give organic compound.
K2	CO2	Students can able to design a synthesis of new compound.
K3	CO3	Students can able to purify the synthesized compound.
K4	CO4	Students can able to propose the mechanism of chemical reactions
K5	CO5	Students will able to carry out their research in future.

(a) Organic Estimation:

1. Estimation of phenol
2. Estimation of aniline
3. Estimation of methyl ketone
4. Estimation of glucose
5. Estimation of Ascorbic acid
6. Determination of saponification value of an oil

(b) Two stage organic preparations and Rearrangements:

1. sym-Tribromobenzene from aniline (Bromination + Hydrolysis)
2. p-nitroaniline from acetanilide (Nitration + Hydrolysis)
3. Benzanilide from benzophenone (Rearrangement)
4. m-nitroaniline from nitrobenzene (Nitration + Reduction)
5. p-Bromoaniline from acetanilide (Bromination + Hydrolysis)

CONTENT BEYOND THE SYLLABUS

1. Developing a novel method to estimate a compound with medicinal value.

Develop a novel method to synthesis a compound.

REFERENCES

1. Dr. N.S Gnanapragasam , Organic chemistry Lab manual.

2. Raj .K. Bansal, Laboratory Manual of Organic chemistry, 3rd Edition, New Age Internal Publication .
3. B.S. Furniss, A.J.Hannaford, P.W.D Smith and A.R. Tatchell, Vogel's Practical Organic chemistry, 5th Edition. ELBS

ONLINE SOURCES

1. http://wwwchem.uwimona.edu.jm/lab_manuals/c10expt25.html
2. http://vlab.amrita.edu/?sub=2&brch=191&sim=345&cnt=1
3. http://amrita.olabs.edu.in/?sub=73&brch=8&sim=116&cnt=1

Mapping

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CO3	VS	S	VS	S	VS	VW
CO4	S	S	W	S	S	VS
CO5	VW	VW	VW	VW	VS	S

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Programme code	M.Sc.,	Programme Title	Master of Science (Chemistry)	
Course Code	18P4CHP04	Title	Batch	2018-2020
		CORE PRACTICAL – V	Semester	IV
Hrs/Week	5	INORGANIC CHEMISTRY PRACTICAL– II	Credits	04

Course Objective

1. To acquire training in micro scale experimental techniques.
2. To acquire knowledge on the properties of ions and their compounds.
3. To educate the students about the complex formation reaction, influence of pH, stability of complexes and application of complex formation reaction in analytical chemistry.
4. To impart knowledge about variation in the chemical behavior of elements in the same group.
5. To promote the students towards research activity and job opportunities.

Course Outcomes (CO)

K1	CO1	Students will learn how to conduct a process systematically and precisely.
K2	CO2	The qualitative analysis gives a type of mental training and develops a power of reasoning not equal to any other course in chemistry.
K3	CO3	The students will learn the nature, significance, and influence of errors and how they may best be avoided or minimized during qualitative and quantitative examination of a chemical compound.
K4	CO4	Students will able to design and synthesize new complexes
K5	CO5	Students will able to carry out their research in future.

(a) Quantitative analysis of the following mixture

1. Iron and Magnesium
2. Iron and Nickel
3. Copper and Nickel
4. Copper and Zinc

(b) Preparations of the following complexes

1. Tris(thiourea)copper(I) chloride
2. Bis(acetylacetanato) copper(II)
3. Hexamminecobalt(III) chloride
4. Sodium hexanitrocobaltate(III)
5. Potasium trioxalatoaluminate(III) trihydrate

6. Chloropentamminecobalt(III) chloride

7. Hexamminenickel(II) chloride

CONTENT BEYOND THE SYLLABUS

1. Estimate the hardness of water using EDTA.
2. Analyze the given cation using different qualitative methods.

REFERENCES

1.J. Mendham, R.C. Denney, J.D. Barnes, M.J.K. Thomas, Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Pearson Education (2001).

2. V. Venkateswaran, R. Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).

ONLINE SOURCES

1. http://lib.hku.hk/Press/9622092128.pdf
2. http://www.kvsunjuwan.com
3. http://science-blogs.ucoz.com/resources/notes/msc/pract1/CationGuide.pdf

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	S	S	VS	VS	VS	S
CO2	W	W	VW	VW	W	VW
CO3	VS	S	VS	S	S	S
CO4	S	VS	W	VW	S	S
CO5	VW	S	S	S	VS	VW

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VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN

(AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION –III SEMESTER

MODEL QUESTION- ORGANIC CHEMISTRY III

Time: 3 Hrs **Max Marks: 75**

PART-A

Answer all the questions **20 X 1 = 20**

1. _____ are normally occurring nitrogen compounds that are generally obtained by plants.
   a) terpenes b) alkaloids c) steroids d) none of the above
2. The term _____ includes a wide range of natural compounds from terpenes to steroids.
   a) terpenoids b) flavonoids c) flavones d) flavanol
3. Predict a terpenoid from the following,
   a) daidzein b) morphine c) xanthine d) zingiberene
4. When oxidized with cold dilute KMnO4 papaverine is converted into _____
   a) papaverinol b) papaveroline c) papaverine d) papaverinic acid
5. Steroids are _____ derivatives that are widely present in plants and animals
   a) biterpene b) triterpene c) teteracyclic triterpene d) none of the above
6. _____ is an example for sterols
   a) glycosides b) sapogenins c) cholesterol d) gastogens
7. Vitamin B_{12} is also known as _____
   a) niacin b) thiamine c) cyanocobalamine d) riboflavin
8. Clolesterol is a white crystalline solid, which is optically _____
   a) active b) inactive c) stable d) less stable
9. The fundamental nucleus in anthocyanines is _____
   a) fluoroglucinol b) benzopyrylium chloride c) phenolic acid d) none of the above
10. Anthocyanins with free OH^- groups in th 3-position are raadily _____ by $FeCl_3$
    a) reduced b) hydrolyzed c) oxidized d) none of the above
11. One of the important xanthine bases, that occur naturally is _____
    a) Caffeine b) guanine c) purine d) adenine
12. Combination of nucleoside with phosphoric acid yields _____
    a) inosine b) ribose c) uracil d) nucleotide

13. Pericyclic reactions are highly _____

a) electrophilic b) nucleophilic c) stereospecific d) stereoselective

14. the photochemical suprafacial mode of cycloaddition is _____

a) symmetry forbidden b) thermally allowed

c) thermally forbidden d) symmetry allowed

15. Cope and Claisen rearrangements are _____

a) cycloadditions b) electrocyclic reactions

c) cyclocondensations d) sigmatropic rearrangements

16. Diels-Alder reaction is the well known example of _____

a) cycloadditions b) electrocyclic reactions

c) cyclocondensations d) sigmatropic rearrangements

17. find one of the important green chemistry principles from he following,

a) wastage b) energy framework c) Design for energy efficiency d) hazardous

18. Strecker is the reaction of an aldehyde with NH_3 and HCN yields _____

a) α-aminonitrile b) β-aminonitrile c) α-aminophenol d) β-aminophenol

19. Rearrangements of allyl aryl ethers to *o*- or *p*- allylphenols is known as _____ rearrangement

a) Fries b) Claisen c) Wolff d) Beckmann

20. _____ reactions do not involve ionic or free radical intermediates

a) addition b) substitution c) elimination d) pericyclic

PART - B

Answer all the questions **5 X 5 = 25**

21. (a) What are alkaloids? Explain its classification in brief. **(OR)**

(b) Describe the following synthesis,

1) Papaverine 2) Zingiberene

22. (a) Explain about the Kostaneck synthesis of flavones. **(OR)**

(b) Describe the structural elucidation of vitamin B_{12} in brief.

23. (a) Write a detailed note on cycloaddition. **(OR)**

(b) Explain the Claisen rearrangement with mechanism.

24. (a) Describe the synthesis of anthocyanin in detail.. **(OR)**

(b) Write a short note onadenosine-5'-phosphate.

25. (a) What are pericyclic reactions? Explain it with suitable example. **(OR)**

(b) Write a detailed note on polymer supported green reagent.

PART - C

Answer any three of the questions **3 X 10 = 30**

26. Explain the structural elucidation of α - pinene.

27. What are steroids? Describe the structural elucidation of estrone in detail.

28. Explain the FMO method for analyzing an electrocyclic reactions with an example.

29. Explain the structure and biological applications of anthocyanins in detail.

30. What is meant by green chemistry? Explain its principles in detail.

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(Autonomous)
M.Sc. DEGREE EXAMINATION
MODEL QUESTION - INORGANIC CHEMISTRY-III

Time : 3 hrs **Maximum : 75 Marks**

SECTION A – (20x 1 = 20 marks)

Answer All the Questions

1. Which statement is incorrect?
   (a) $Zn(OH)_2$ is insoluble in water (b) $Zn(NH_2)_2$ is insoluble in liquid NH_3 (c) Alkali metal salts of $[Zn(OH)_4]^{2-}$ are soluble in water(d) Alkali metal salts of $[Zn(NH_2)_4]^{2-}$ are insoluble in liquid NH_3
2. Liquid HF undergoes self ionization to give a liquid that contains:
   (a) $[H_2F]^-$ (b) $[HF_2]^-$ (c) H^+ (d) F^-
3. Which of the following non-aqueous solvents has the longest liquid range?
   (a) H_2SO_4 (b)N_2O_4 (c) NH_3 (d) HF
4. Protogenic solvent is
   (a)Sulphuric acid (b)Hydrochloric acid (c)Nitric acid (d)all
5. Which one of these is not electrolyte?
   (a) sodium chloride solution (b) acidulated water (c) sugar (d) sodium hydroxide solution
6. Which method of analysis does not classify variables as dependent or independent?
   (a) regression analysis (b) discriminant analysis(c) analysis of variance (d) cluster analysis
7. In cluster sampling, elements of selected clusters are classified as
   (a) elementary units (b) primary units (c) secondary units (d) proportional units
8. Which one of the following atoms does NOT have an octet?
   (a) chloride ion (b) neutral N atom in amines (c) positive N in ammonium ions (d) neutral B in boranes.
9. The smallest repetitive unit of the crystal structure is known as_____
   (a) atoms (b) compound (c) unit cell (d) Lattice
10. Crystals in which the number of the combinations of the symmetric molecule is limited to 32 is known as _____
    (a) Crystallographic unit cell (b) Crystallographic point groups (c) Crystallographic crystals (d) crystallographic atoms.

11. The point coordinates of the vertex just opposite to the origin are
(a) 0 0 0 (b) 0 0 1 (c) 0 1 1 (d) 1 1 1

12. Example for dia-magnetic materials
(a) super conductors (b) alkali metals (c) transition metals (d) Ferrites

13. Which of the following is the principle of Atomic Absorption Spectroscopy?
(a) Radiation is absorbed by non-excited atoms in vapour state and are excited to higher states (b) Medium absorbs radiation and transmitted radiation is measured
(c) Colour is measured (d) Colour is simply observed

14. In Atomic Absorption Spectroscopy, which of the following is the generally used radiation source?
(a) Tungsten lamp (b) Xenon mercury arc lamp (c) Hydrogen or deuterium discharge lamp (d) Hollow cathode lamp

15. ESCA gives sufficient chemical information up to a depth about _____ armstrong in metals.
(a) 5-20 (b) 15-40 (c) 40-100 (d) 100-200

16. Discrete electrons cannot be observed in electron ionization of an atom due to which of the following reasons?
(a) Environmental disturbances (b) Same mass (c) Same charge (d) the Electron-electron interaction

17. Oxidation state of Iron in haemoglobin is
(a) +1 (b) +2 (c) +3 (d) none

18. The ligand system present in vitamin B_{12}
(a)porpyrin (b) corrin (c) Phthalocyanin (d) crown ether

19. Central metal atom/ion in chlorophyll is
(a)Iron (b) Manganese (c) Magnesium (d) Zinc

20. What are the complications that occur in severe thalassemia disease?
(a) Bone deformities (b) Enlarged spleen (c) Heart problems (d) All of the above

SECTION B – (5 x 5 = 25 marks)

Answer All the Questions

21. (a) Write a note on reaction in anhydrous sulphuric acid. **(**OR**)**
(b)What are the factors affecting extraction?

22. (a) Describe about two dimensional silicates with an example. (OR)
(b) State and explain Wade's rule with an example.

23. (a) Write notes on space groups and miller indices.(OR)

(b)Explain magnetic properties of solids.

24. (a) Describe about principle of AAS. (OR)

(b) Write notes on Koopman's theorem and chemical shift.

25 (a) Explain the structure and work function of haemoglobin. (OR)

(b) Describe about chelate therapy.

SECTION C – (3 x 10 = 30 marks)

Answer Any three Questions

26. Explain reactions in liquid ammonia and sulphur dioxide.

27. Draw and explain the structure of B_4H_{10} and B_6H_{10}.

28. Explain defects in solids.

29. Discuss theory and applications of PES.

30. Explain the structure and work functions of Chlorophyll.

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
M.Sc. DEGREE EXAMINATION - III SEMESTER
MODEL QUESTION – PHYSICAL CHEMISTRY – II

Time: 3 hrs **Max Marks: 75**

Section –A
Answer all the questions **20 x 1 = 20**

1. The de-Broglie wavelength of a particle having kinetic energy E is given by
   a) $\lambda = h/\sqrt{E}$ b) $\lambda = h/\sqrt{2mEs}$ c) $\lambda = h/\sqrt{mE}$ d) $\lambda = h/\sqrt{3mE}$
2. According to Schrodinger, a particle is equivalent to a
   a) wave packet b) single wave c) light wave d) none of the above
3. The Schrodinger time independent equation can be written as
   a) $H\Psi = E\Psi$ b) $H\Psi = (E - V)\Psi$ c) $H\Psi = (E + V)\Psi$ d) $H\Psi + E\Psi = 0$
4. For the particle moving in x-direction and having a wave function $\Psi = A\sin(kx-\omega t)$, its energy is
   a) $k^2\hbar^2/2m$ b) $k\hbar/2m$ c) $\hbar^2 k^2/2m$ d) $m^2\hbar^2$
5. If n represents the number of eigen states of a hydrogen atom, then its discrete energy levels are proportional to
   a) n b) n^2 c) $1/n$ d) $1/n^2$
6. What is the degeneracy of H-atom in state n=3
   a) 5 b) 7 c) 9 d) 18
7. The quantum mechanical operator for the momentum of a particle moving in one dimension is given by
   a) $i\hbar\, d/dx$ b) $-i\hbar\, \delta/\delta x$ c) $i\hbar\, \delta/\delta t$ d) $-\hbar^2/2m \times d^2/dx^2$
8. The sum of the energies of the third and the fourth levels is
   a) $10\,\pi^2\hbar^2/mL^2$ b) $10\,\pi^2\hbar^2/3mL^2$ c) $11\,\pi^2\hbar^2/mL^2$ d) $15\,\pi^2\hbar^2/mL^2$
9. The rate of change of chemical potential with temperature will in the order for solids, liquids and gases is
   a) $S^s < S^l < S^g$ b) $S^l < S^g < S^s$ c) $S^g < S^s < S^l$ d) $S^l < S^s < S^g$
10. The relationship between fugacity and activity coefficient is
    a) $f/P = \Upsilon$ b) $P/f = \Upsilon$ c) $P/\Upsilon = f$ d) $\Upsilon/P = f$
11. At freezing point the fugacity of water will be for solid and liquid phases is
    a) $f_{ice} = f_{water}$ b) $f_{ice} < f_{water}$ c) $f_{ice} > f_{water}$ d) none of the above
12. The expression for activity coefficient is
    a) $\Upsilon = a/c$ b) $\Upsilon = c/a$ c) $c = a\Upsilon$ d) $\Upsilon/a = c$
13. In Raman spectroscopy, using mercury vapour lamp
    a) the stokes line is more intense than the anti-stokes line.
    b) the anti-stokes line is more intense than the stokes line.
    c) the stokes and anti-stokes lines are equally intense.
    d) None of the above.

14. In a rotational spectrum, transitions are only observed between rotational levels of ΔJ =
    a) ± 1 b) ± 2 c) ± ½ d) ± 3
15. For pure vibrational spectra, the selection rule is
    a) 0 b) ± 1 c) 0, ± 1 d) ± 1,2
16. The J_{max} for a rigid diatomic molecule for which at 300 K, the rotational constant is 1.566cm^{-1}, is
    a) 4 b) 6 c) 8 d) 10
13. The normal modes of vibrations of N_2O is
    a) 1 b) 3 c) 4 d) 7
14. If force constant, k, of a diatomic simple harmonic oscillator is equal to
    a) $4\pi^2c^2\tilde{\nu}\mu^2$ b) $4\pi^2c^2\tilde{\nu}\mu$ c) $4\pi^2c\tilde{\nu}\mu$ d) None of the above
15. The molecule which is IR-inactive and Raman-active is
    a) N_2 b) HCl c) SO_2 d) protein
16. The rotational spectrum of a rigid diatomic rotor consists of equally spaced lines with spacing equal to
    a) B b) B/2 c) 3B/2 d) 2B

Section – B

Answer all the questions. 5 X 5=25

21. a) List out the postulates of quantum mechanics and discuss about eigen value and eigen function (OR)
    b)Derive the Schrodinger equation for a particle moving in a one dimensional box.
22. a)Discuss the application of Approximation methods to ground state energy of hydrogen atom (OR)
    b)Write in detail about the Hartree-Fock's SCF method.
23. a) Derive the expression for variation of chemical potential with temperature and pressure(OR)
    b) How will you determine the fugacity of a gas from equation of state.
24. a) Write short note on various transitions in a molecule (OR)
    b) Write short account on the effect of isotopic substitution of co molecule.
25. a) Given a short account on Born-Oppenheimer approximation. (OR)
    b) Discuss the differences between Rayleigh and Raman scattering.

Section –C

Answer any three questions. 3 x 10 = 30

26. Derive the Schrodinger's energy equation for the H – atom
27. Write detailed account on Huckel's MO theory for application to ethylene molecule.
28. Discuss the method to determine the solvent activity by vapour pressure and cryoscopic method
29. Explain rotational spectra of diatomic molecules as rigid rotors.
30. Explain the Raman's rotational spectra of symmetric top and spherical top molecules.

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN

(AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION - IV SEMESTER

MODEL QUESTION- PHYSICAL CHEMISTRY – III

Time: 3 Hours Max. Marks: 75

PART – A (20 x1 = 20 Marks)

Answer all the questions

1. Molecules of a dilute gas are identical, distinguishable particles which obey…….statistics.

a) Maxwell-Boltzmann b) Bose-Einstein c) Fermi-Dirac d) Rayleigh-Jeans

2. The vibrational energy levels of a diatomic are given by

a) $E_n = (n +1/2)\ h\nu$ b) $E_n = (n +1)\ h\nu$

c) $E_n = (n +2)\ h\nu$ d) all the above

3. What is the rotational partition function of H_2 at 300 K?

a) 1.923 b) 1.723 c) 1.823 d) 1.623

4. A partition function can be used to calculate

a) Free energy b) Enthalpies c) Entropies d) none of these

5. The essential contribution to the thermodynamics of the non-equilibrium systems was brought by

a) Fermi b) Einstein c) Pokrovskii d) Prigogine

6. Non-equilibrium thermodynamics is concerned with transport processes and

a) energy of chemical reactions b) rates of chemical reactions

c) frequency d) state variables

7. The thermodynamic study of non-equilibrium steady states, in which entropy production and some flows are

a) Zero b) Non-zero

c) one d) none of these

8. The entropy (S) is a function of the collection of

a) Intensive variable b) Massieu potential

c) extensive quantities d) extended Massieu function

9. UV spectroscopy is useful for the detection of

a) functional group b) extent of conjugation

c) geometrical isomers d) all of these

10. The energy difference between π and π^* is ….. kcal/mole

a) 186 b) 176 c) 196 d) 166

11. An auxochrome is one which is

a) colour enhancing b) atom with lone pair of electrons

c) extending conjugation d) all of these

12. The main advantage of fluorescence over UV-Vis spectroscopy is

a) Its sensitivity b) Its compatibility with separation techniques

c) Its compatibility with most analytes d) None of the above

13. NMR spectra are observed in …….. region

a) radio frequency b) microwave c) UV/Vis d) X-ray

14. Which of the following sovents cannot be used in NMR spectroscopy?

a) CCl_4 b) CS_2 c) $CHCl_3$ d) $(CCl_3)_2C=O$

15. Vicinal F-F coupling ranges from ……. cps

a) 43-370 b) 0-58 c) 0-39 d) 42-80

16. ESR is used to control the state of electron spin qubits in

a) diamond b) gallium c) silicon d) all the above

17. The molecular ion peak is usually intense for

a) aromatic compounds b) conjugated olefins

c) alcohols d) neoalkanes

18. In case of polynuclear hydrocarbons, the base peak appears

a) as parent ion peak b) at 91 due to tropyium ion

c) at 77 due to phenylcation d) None of these

19. McLafferty rearrangement base peak in mass spectrum is usuay the base peak for

a) adehydes b) ketones c) acids d) all of these

20. Mossbauer Spectroscopy associates with ……. rays

a) radio b) gamma c) X-ray d) Cosmic

PART – B (5 x 5 = 25 Marks)

Answer ALL the questions

21. (a) Write down the objectives of statistical thermodynamics. (OR)

(b) Outline about distribution of distinguishable and non distinguishable particles.

22. (a) Justify the entropy production in heat flow and matter flow. (OR)

(b) Describe in detailed about Onsager reciprocal relation.

23. (a) Explain the possible types of electronic transitions in UV spectroscopy. (OR)

(b) Explain the principles and applications of fluorescence spectroscopy.

24. (a) Write a short note on spin-spin coupling. (OR)

(b) Explain g value and coupling constant in ESR spectroscopy.

25. (a) Write a brief note on Mclattery rearrangement. (OR)

(b) Explain line width and isomer shift in Mossbauer spectroscopy.

PART – C (3 x 10 = 30 Marks)

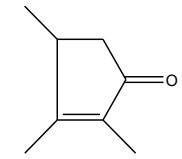
Answer ANY THREE questions

26. Derive Bose-Einstein statistics law.

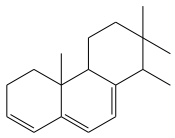
27. Explain the verification of Onsager reciprocal relation using diffusion phenomenon.

28. Calculate λ_{max} for the following compounds.

(i)



(ii)



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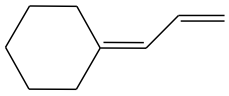

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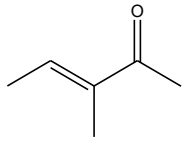

29. Define chemical shift. What are the factors affecting chemical shift.

30. Draw and explain the components of mass spectrophotometer.

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(Autonomous)
M.Sc. DEGREE EXAMINATION
MODEL QUESTION PAPER- ENVIRONMENTAL CHEMISTRY

Time: THREE Hour **Maximum : 75 Marks**

SECTION A – (20 x 1 = 20 marks)
Answer ALL Questions.

1. Which of the following is produced when electrical discharges pass through oxygen in air?
   a) Ozone b) Methane c) CFCs d) Lead compounds
2. Temperature of outer mesosphere is
   a) 93^{o}C b) -93^{o}C c) 5^{o}C d) -5^{o}C
3. Disease caused by eating fish found in water contaminated with industrial waste having mercury is
   a) Minamata disease b) Brights disease c) Hashimotos disease d) Osteosclerosis.
4. Which of the following play significant role in depletion of ozone layer?
   a) Oxides of nitrogen b) Oxides of carbon c) Oxides of sulphur d) None of the above
5. The optimum value in natural water is _____
   a) 2-4ppm b) 4-7ppm c) 4-6ppm d) 2-7ppm
6. By aerobic process _____ of biodegradable water is converted into the biomass.
   a) 10% b) 30% c) 50% d) 75%
7. Reacting the water with _____ removes the odour due to the phenols.
   a) $KMnO_4$ b) MnO_4 c) Potassium d) Magnesium
8. Bio-chemical oxygen demand (BOD) for the first 20 days in generally referred to
   a) Initial demand b) First stage demand c) Carbonaceous demand d) All of these
9. Plastics enter the marine environment primarily by
   a) being dumped or lost there b)debris carried in runoff
   c) washing out of landfills d)none of the answers are correct
10. Which of the following is a health hazard often found in kitchen cabinets and furniture?
    a) Mold b) Radon c) Asbestos d) Formaldehyde
11. Polychlorinated biphenyls (PCBs), affecting
    a) Estrogen metabolism b)Blood Circulation
    c) Cell membrane d) Biodegradable
12. Polychlorinated biphenyls' are by products of plastics, lubricants, rubber and
    a) Paper production b) Wood production c) Steel production d) All of above
13. What is impact of overuse of inorganic fertilizers?
    a) High level of nitrates & Eutrophications b) Salinization
    c) Desalinization d)Increase soil Fertility

14. Costly and harmful pesticides can be replaced by
    a) Artificial Predators b)Natural Predators c)Small Animals d)Weeds
15. What are impact of over cultivation & over grazing ?
    a) Soil Erosion, Degradation, Desertification b) Desertification & Salinization
    c) Soil erosion & Salinization d) Eutrophication
16. If water containing DDT (dichloro-diphenyl-trichloroethane: $C_{14}H_9O_5$) is fed upon by cattle, it will
    a) get stored in the liver b) get stored in the fatty tissues of animals
    c) be excreted out with urine d) get stored in the muscle fibers
17. The simplest and most common method used in the cities is to collect and dump the waste in a ___ .
    a) landfill b) river c) ocean d) any of the above
18. Which of the below is not an idea behind solid waste management?
    a) Control of waste generation b) Storage and collection
    c) Disposal d) Stop waste generation
19. Under which rule of Government, guidelines for solid waste management are followed today?
    a) Municipal Solid Waste Rules, 2000 b) Municipal Solid Waste Rules, 2016
    c) Solid Waste Rules, 2000 d) Solid Waste Rules, 2016
20. Which gas produced in open dumps from the decomposition of biodegradable waste?
    a) Ethane b) Methane c) Propene d) Ethene

SECTION B – (5 x 5 = 25 marks)

Answer ALL Questions

21. (a). Explain the terms of chemical potential and chemical equilibria in environmental Concept. (OR)
    (b). Write short notes on fundamentals of environmental chemistry
22. (a). Discuss the detrimental effects of inorganic pollutants in water. (OR)
    (b). Explain redox potential in water chemistry.
23. (a). Write a short note on Polychlorinated Biphenyls. (OR)
    (b). Write a note on sources of asbestos in the environment.
24. (a) Write the short notes on Environmental Implications of Fungicides and Herbicides. (OR)
    (b).Explain the Environmental implications of Insecticides.
25. (a) Write notes on Municipal waste into road making. (OR)
    (b). Explain notes on Waste management.

SECTION C – (3 x 10 = 30 marks)

Answer Any THREE questions.

26. Explain the sample techniques for air, water and soil in Environmental chemistry.
27. What is COD and BOD? Explain with suitable method to calculate.
28. Explain the Environmental Implications of Polymers and Plastics.
29. Explain the Abatement procedures for fungicides and Herbicides pollution.
30. Write the notes on the following (i) Utilizing agricultural waste (ii) Wealth from waste.

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc.,DEGREE EXAMINATION –III SEMESTER

MODEL QUESTION-EDC- APPLIED POLYMER CHEMISTRY

Time: 3hrs **Max.Marks: 75**

PART-A

Answer all the questions **20x1= 20**

1. Which one of the following is not correct?
   a) A homopolymer is a polymer made from only one type of monomer
   b) A macromolecule is a larger molecule built by the repetition of small chemical unit
   c) A copolymer is a polymer made from two or more different monomer
   d) A heteropolymer is a polymer that has atoms besides carbon as per the chain back bone
2. Caprolactum is the monomer of
   a) Nylon-6 b) PVC c) Bakelite d) Teflon
3. Compounds containing reactive double bonds can undergo_____reaction.
   a) Redox polymerization b) Ionic polymerization c) Chain polymerization
   d) Condensation polymerization
4. Which of the following is an example for network polymer?
   a) Terylene b) Bakelite c) nylon-6,6 d) polyester
5. The metal ion used in Zeigler-Natta catalyst is
   a) Ir b) Rh c) Ti d) Ni
6. Polymerization of olefins and dienes catalysed by organo metallic compounds are known as
   a) Free radical polymerization b) Coordination polymerization
   c) Addition polymerization d) Condensation polmerization
7. Which one of the following is an example of co-polymer?
   a) Buna-S b) Teflon c) Polypropylene d) PVC
8. The species which can best serve as an initiator for cationic polymerization is:
   a) $LiAlH_4$ a) HNO_3 b) $AlCl_3$ c) BaLi
9. A polymeric molecules possess the molecular weight _____
   a) Different b) Fixed c) That cannot be determined d) May be determined
10. The strength of the polymer increases with _____in molecular weight.
    a) Decrease b) Increase c) Slightly increase d) No change

11. The impact strength is measured as_____

a) Elasticity b) Strength c) Permeabilityd) Toughness

12. The molecular weight of the polymers is measured by :

a) Viscosity method b) Light scattering method c) Ultracentrifugtion method

d) All the above

13. The polymer which is used for injection moulded articles is

a)Polystyrene b) styrene-acrylonitrile c) acrylonitrile-butadiene-styrene

d) polyethylene

14. Why are the plasticisers added with polymers?

a) To hold other constituents of plastic together

b) To reduce cost and enhance the strength and hardness of plastics

c) To improve flexibility and to reduce the temperature and pressure required for moulding of plastics

d) None of the above

15. Elastomers and plastics differ due to their properties of_____

a) Resistivity b) Dielectric strength c) Acoustic insulation d) Extensibility

16. _____is a reinforcement filler.

a) Carbon black b) Chinaclay c) $BaSO_4$ d) Chalk

17. Adhesives are examples for

a) Polystrenes b) Epoxy resins c) Polyester d) Polyvinyl chloride

18. The polymer which is used in the fabrication of artificial blood vessels is_____

a) Polyester b) Polyvinyl chloride

c) Flouro alkoxy substituted phosphonitrilic polymers d) Teflon

19. Silicone polymers are_____

a) Linear polymer b) Addition polymer c) Cross-linked polymer d) Copolymer

20. Which of the following phenolic resins are suitable for the decorative laminates?

a) Caustic soda catalyzed resols b) Ammonia catalyzed resols

c) Spirit resols d) Resites

PART-B

Answer all the questions **5x5=25**

21. a). Explain the mechanism of free radical polymerization. (OR)

b). Give account on emulsion polymerization technique.

22. a). Write note on Ziegler-Nata Catalyst and its advantages. (OR)

    b). Describe block and graft co-polymers with examples.

23. a). Write note on thermal degradation of polymer. (OR)

    b). How the molecular weight of the polymer is measured by viscometry method.

24. a). What are fibres? Write the preparation method and uses of carbon fibre. (OR)

    b). Discuss the compounding technique by extrusion method.

25. a). Explain the preparation, properties uses of polyamides. (OR)

    b). What are high temperature and fire resistant polymers.

PART-C

Answer any three questions **3x10= 30**

26. How the condensation polymerization is carried out in homogeneous and heterogeneous systems.
27. Write the synthetic methods of any two cross-linked polymers and list out their applications.
28. What is glass transition temperature? What are the factors that affect the glass transition temperature?
29. Write note on processing techniques of polymer.
30. Discuss about the applications of polymers in medical field.