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.)

CHEMISTRY

M.Sc., CHEMISTRY
REGULATIONS AND SYLLABUS

[FOR CANDIDATES ADMITTED FROM 2020-21 ONWARDS UNDER AUTONOMOUS – OBE & CBCS 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 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 2020-21 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2020-21 and thereafter.

XII. COURSE PATTERN (OBE)

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(AUTONOMOUS)

SYLLABUS FRAME WORK

Subject & Code	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**						
Concepts of Organic Chemistry and Stereochemistry & 20P1CH01	5	5	3	25	75	100	Organic Reaction Mechanism & 20P2CH04	5	5	3	25	75	100
Transition metal and Nuclear Chemistry & 20P1CH02	5	5	3	25	75	100	Chemical Bonding and Coordination Chemistry & 20P2CH05	5	5	3	25	75	100
Group theory, Kinetics and Surface Chemistry & 20P1CH03	5	5	3	25	75	100	Elective Course	5	4	3	25	75	100
Elective Course	4	4	3	25	75	100	Organic Chemistry Practical-I & 20P2CHP01	5	4	6	40	60	100
Organic Chemistry Practical-I & 20P2CHP01	4	-	-	-	-	-	Inorganic Chemistry-Practical-I & 20P2CHP02	5	4	6	40	60	100
Inorganic Chemistry-Practical-I & 20P2CHP02	4	-	-	-	-	-	Physical Chemistry-Practical I & 20P2CHP03	4	4	6	40	60	100
Physical Chemistry-Practical-I & 20P2CHP03	3	-	-	-	-	-	Library	1	-	-	-	-	-
Library		-	-	-	-	-		-	-	-	-	-	-
Total	**30**	**19**	**12**	**100**	**300**	**400**	**Total**	**30**	**26**	**27**	**195**	**405**	**600**
I YEAR TOTAL									**45**	**39**	**295**	**705**	**1000**

YEAR II													
Semester III							**Semester IV**						
Natural Products, Pericyclic reactions and Retro synthesis & 20P3CH06	4	5	3	25	75	100	Physical methods in Chemistry & 20P4CH09	5	5	3	25	75	100
Organometallic, Solid state, Spectroscopy and Bio-inorganic Chemistry & 20P3CH07	4	5	3	25	75	100	Elective Course	4	4	3	25	75	100
Quantum Chemistry and Thermodynamics & 20P3CH08	4	5	3	25	75	100	Organic Chemistry Practical-II & 20P4CHP04	5	4	6	40	60	100
NMEC	4	4	3	25	75	100	Inorganic Chemistry-Practical-II & 20P4CHP05	5	4	6	40	60	100
Organic Chemistry Practical-II & 20P4CHP04	4	-	-	-	-	-	Physical Chemistry-Practical-II & 20P4CHP06	4	4	6	40	60	100
Inorganic Chemistry-Practical-II & 20P4CHP05	4	-	-	-	-	-	Library	1	-	-	-	-	-
Physical Chemistry-Practical-II & 20P4CHP06	4	-	-	-	-	-	Project	6	4	-	40	60	100
Human Rights & 20P3HR01	2	1	3	25	75	100							
Total	**30**	**20**	**15**	**125**	**375**	**500**	**Total**	**30**	**25**	**24**	**210**	**390**	**600**
							II YEAR TOTAL		**45**	**39**	**335**	**765**	**1100**
TOTAL CREDIT FOR THE COURSE									**90**	**68**	**630**	**1470**	**2100**

ELECTIVE COURSES

Semester	Category	Course code	Course title	Contact hrs per week	Credits	
					Min	Max
I	Elective	20P1CHE01	Nanoscience and Nanotechnology	4	4	4
	Elective	20P1CHE02	Instrumental Methods of Analysis	4	4	4
II	Elective	20P2CHE03	Electrochemistry and Photochemistry	4	4	4
	Elective	20P2CHE04	Organic Spectroscopy	4	4	4
III	Elective	20P3CHED01	Applied Polymer Chemistry	4	4	4
	Elective	20P3CHED02	Industrial Chemistry	4	4	4

IV	Elective	20P4CHE05	Environmental Chemistry	4	4	4
	Elective	20P4CHE06	Corrosion Principles, Protection and Monitoring	4	4	4

*EXTRA CREDIT EARNING PROVISION

Semester	Course code	Course title	Credits
I	20P1CHEC1	Online Course	1
I	20P1CHEC2	Water Quality Analysis **(Self Study Paper)**	1
I	20P1CHEC3	Dairy Chemistry **(Self Study Paper)**	1
II	20P2CHEC4	Online Course	1
II	20P2CHEC5	Green Chemistry **(Self Study Paper)**	1
II	20P2CHEC6	Research Methodology **(Self Study Paper)**	1
II	20P1CHEC7	Online Course	1

*** Not considered for grand total and CGPA**

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

PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media

	confidently share ones views and express herself /himself.
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a

	team who can help achieve the vision motivating.
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.

Programme Specific Outcomes

PS01: To foster a theoretical and practical knowledge on chemistry and its applications and to make responsible citizenships.

PS02: To deliver core and advanced courses on the applied chemistry.

PS03: To deepen learner-capacity for productive scientific thinking both within and beyond the classroom through extensive programmes.

PS04: To cultivate problem solving skills through chemical knowledge to address environmental problems, and to complement and reflect on social needs.

PS05: To develop innovative thinking, generate creative ideas towards scientific knowledge through well-structured seminars and assignments.

PS06: To apply modern methods of analysis to chemical systems in a laboratory setting.

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**1**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P1CH01	CORE PAPER I: Concepts of Organic Chemistry and Stereochemistry		5			05	25	75	100
Course Objectives	To enable the students to learn about the chemistry of organic compounds and to enrich the knowledge in various organic reactions.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will be known to name the organic compounds systematically and they will be able to assess the aromaticity of any organic compounds.
CO 2	Students can able to understand the formation of intermediates in organic reactions and the students can able to determine the mechanism of new organic reactions.
CO 3	Students can able to understand the nucleophillic substitution reactions.
CO 4	Knowledge of students will be enriched with stereochemistry and various types of substitution reactions which will help the students to carry out the research in future.
CO 5	Students will systematically name the natural products and will study their stereochemistry.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	4	PO 1	2
		PO 2	1
CO 2	1	PO 3	5
		PO 4	5
CO 3	3	PO 5	4
		PO 6	6
CO 4	5	PO 7	2
		PO 8	4
CO 5	6	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	2
PSO 3	1	PO 15	1

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO2	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO5	1	1	2	2	1	3	1	1	1	1	1	1	1	3	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	1	3	2	2	1
PSO2	2	2	1	3	2
PSO3	2	1	2	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Nomenclature and Aromaticity**	Periods	15
	Nomenclature of aromatic heterocyclic compounds (containing one or two hetero atoms) – Nomenclature of alicyclic, bicyclic and tricyclic compounds. Concept of Aromaticity – aromatic character of benzene and heterocyclic compounds – benzene, pyrole and pyridine. Effect of aromaticity on bond length, resonance energy and induced ring currents. Huckels rule – concept of homoaromaticity and antiaromaticity. Nonbenzenoid aromatic compounds – cyclopropeniumcation, cyclopentadienyl anion, ferrocence, diazocyclopentadiene, sydnones, azoulene, tropolone ion, tropylium ion and annulenes – their structures and aromaticity.		
Unit - II	**Reactive intermediates and methods**	Periods	15
	Structure, Stability, Generation and Reactions of Carbocation (Classical and Nonclassical), carbanions, carbenes, nitrenes and free radicals.Ylides – Generation, types and reactions. Enamines - Generation and reactions. Thermodynamic and kinetic control – methods of determination of reaction mechanisms – product analysis – determination of the presence of intermediate, isolation, detection, trapping – cross of experiments – isotopic labeling - isotopic effect – stereo chemical evidence – kinetic evidence. Microscopic reversibility – Hammond Postulate - Linear free energy relationship – Hammette equation – Taft equation - Limitations, application and deviations.		
Unit - III	**Nucleophilic substitution reactions**	Periods	15
	Aliphatic Nucleophilic substitution reactions: SN1, SN2, SNi mechanism – factors affecting nucleophiclic substitution - Neighbouring group participation, Ambident nucleophilies and ambient substrates. Substitution at vinyl carbon, allylic carbon and bridge head carbon.Von Braun reaction, Claisen condensation and Hydrolysis of ester.		

	Aromatic Nucleophilic substitution reactions: SN1, SN2 and SNAR mechanism. Typhical reactions such as Gattermann reaction, Gattermann Koch reaction, Reimer – Tiemann reaction, Koble reaction. Ziegler alkylation – Chichibabin reaction – Cine substitutions.		
Unit - IV	**Electrophilic Substitution reactions**	Periods	15
	Aromatic Electrophilic substitution reactions: Introduction – Mechanism of Electrophilic substitutions with examples. Orientation and reactivity – Electrophilic substitution on monosubstituted and disubstituted benzenes. Aliphatic Electrophilic substitution reactions: SE1 and SE2 reactions – Mechanism and reactivity. Reaction involving the migration of double bond – Halogenation of carbonyl compounds – Stork Enamine reactions – decarboxylation of aliphatic acids. Friedel craft acylation of olifinic carbon.		
Unit - V	**Stereochemistry**	Periods	15
	Principles of symmetry- concept of chirality, Molecualr symmetry and chirality, Newmann, Sawhorse, Fischer and Wedge representations and interconversions. Types of molecules exhibiting optical activity. Configurational nomenclature of acyclic and cyclic molecules: cis-trans, E & Z, D & L, (+ or –), d & l, R & S, erythro and threo; syn&anti. Stereospecific, Chemo, Regio, Enantio and stereo - selective organic tranformations, asymmetric synthesis – Crams rule. Conformational analysis – 1,2-disubstitutd ethane derivatives – disubstituted cyclohexanes and their stereochemical features. Conformation and reactivity of substituted cyclohexanols (oxidation) cyclohexanones (reduction) and conformations of heterocycles.		
Total Periods			75

Text Books	
1	Mukargee S.H. and Singh S.P., McMillan 1976.
2	Raj K. Bansal, , Hill Publishing Company Ltd 2006.
3	Ernest L. Eliel,Stereochemistry of Carbon Compounds, T.M.H Edition, 1975.
References	
1	Finar I.L.,Organic chemistry Pearson Education P Ltd 2011
E-References	
1	www.masterorganicchemistry.com/2017/02/23/rules-for-aromaticity
2	www.introorganicchemistry.com

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						
Programme	**M.Sc**	Programme Code	**PCH**		Regulations	**2020-2022**	
Department	**Chemistry**		Semester			**1**	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
20P1CH02	CORE PAPER II: Transition metal and Nuclear Chemistry	5			05	25	75	100
Course Objectives	1. To gain knowledge on physical and chemical properties of transition and inner transition elements. 2. To give elaborate insight into the field of nuclear chemistry.							

POs	**PROGRAMME OUTCOME**
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.

COs	COURSE OUTCOME
CO 1	Students will learn the metallurgy and general properties of transition, and inner transition elements.
CO 2	Students can explore constructive application of nuclear chemistry.
CO 3	Students will know the present national and international status in nuclear mission.
CO 4	Students will analyze the various nuclear decay process.
CO 5	Students will evaluate the present methodologies in nuclear waste treatment.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
CO 2	3	PO 3	5
		PO 4	5
CO 3	2	PO 5	4
		PO 6	6
CO 4	4	PO 7	2
		PO 8	4
CO 5	5	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO3	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	3	2	2	1
PSO2	1	2	1	3	2
PSO3	2	1	2	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Transition Elements**	Periods	15
	Position in the periodic table - Electronic configuration - General characteristics - Atomic radii - Ionic radii - Variation along the period and group - Variable valency - Colour - Magnetic properties - Catalytic property - Non-stoichiometry - Stabilization of unusual oxidation states - Structure (only) of d-block complexes - $[Nb_6Cl_{12}]^{2+}$ - $[Re_2Cl_8]^{2-}$ - $[Mo_6Br_8]^{4+}$ -$[Ni_2(DMG)_2]$.		
Unit - II	**Inner Transition Elements**	Periods	15
	Position in the periodic table - Electronic configuration - Oxidation state - Solubility - Magnetic properties - Colour and Spectra - Separation of lanthanides - Lanthanide contraction - Cause and consequences - Gadolinium break - Shift reagents - Extraction of Thorium and Uranium - Comparison of lanthanides and actinides- applications of lanthanides and actinides.		
Unit - III	**Fundamentals of Nuclear Chemistry**	Periods	15
	Nuclear structure-mass and charge - Nuclear moments -Nuclear models (shell model and liquid drop model) - Binding energy - Stability rules - Magic numbers - n/p ratio - Nuclear forces - Modes of radioactive decay - Alpha decay - range - Ionizing power - Energy spectrum - Geiger-Nutta's rule, Theories of alpha decay - Tunnel effect - Beta decay - β^+ and β^- decay - Electron capture - Absorption - Range and Energy - Gamma ray - radioactive de-excitation - decay constant - Nuclear isomerism - Internal conversion - Auger effect.		
Unit - IV	**Nuclear Reactions and Instrumental Techniques**	Periods	15

	Bethe's notation - Q value - Reaction cross section - Threshold energy - Columbic barrier - Excitation function - Various types of nuclear reactions - Scattering - evaporation - photonuclear - Spallation - Fragmentation - Fission - Fusion - Stripping - Pick-up reactions - Detection and measurement of radioactivity - Proportional counter - Geiger-Muller counter - Scintillation counter - Semiconductor detector - Cloud chamber - Charged particle accelerator - Linear accelerator - Cyclotron - Beatron - Synchroton.		
Unit - V	**Nuclear Energy and Trace Elements**	Periods	15
	Nuclear fission and Nuclear reactors - Characteristics of fission reactions - Product distribution of fission, Theories of fission - Fissile and fertile isotopes - Nuclear fusion and stellar energy - Fusion bomb - synthetic elements - Nuclear wastes - nuclear reprocessing - radiation hazards and prevention. Applications of radioactive isotopes - neutron activation analysis - isotopic dilution analysis - Uses of tracers in structural and mechanistic studies, agriculture, medicine and industry - Radio carbon dating - hot atom chemistry - Atomic Power Projects in India- nuclear holocaust.		
Total Periods			75

Text Books	
1	H.J. Arnikar, Essentials of Nuclear Chemistry, 4th Edn., New Age International 2005.
2	J.D. Lee, Concise Inorganic Chemistry, 6th Edn., ELBS, London 1998.
References	
1	D. Shriver, M. Weller, T. Overton, J. Rourke, and F. Armstrong, Inorganic Chemistry, 6th Edn., WH Freeman and Company, New York 2014.
2	C.E. Housecroft, and A.G. Sharpe, Inorganic Chemistry, 4th Edn., Pearson Education Limited, Essex 2012.
E-References	
1	chemed.chem.purdue.edu/genchem/topicreview/bp/ch23/history.php

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**1**	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
20P1CH03	CORE PAPER I: Group theory, Kinetics and Surface Chemistry	5			05	25	75	100
Course Objectives	1. To teach knowledge of classifying the molecules based on symmetry and gain knowledge in identifying the point group of the unknown molecules. 2. Understand the conception of kinetics and catalysis.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will be able to identify point groups using symmetry elements and recognize symmetry operations.
CO 2	Students will learn to integrate knowledge to make rational answers in solving chemical problems.
CO 3	Students can measure the rate of a chemical reaction.
CO 4	Students will learn to evaluate the effect of catalyst, temperature on the rate of a chemical reaction and determine the activation energy.
CO 5	Students will learn and understand the importance, applications and basic aspects of surface chemistry.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	3	PO 1	2
		PO 2	1
CO 2	4	PO 3	5
		PO 4	5
CO 3	1	PO 5	4
		PO 6	6
CO 4	2	PO 7	2
		PO 8	4
CO 5	5	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO2	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO3	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO4	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	3	2	1	2	1
PSO2	2	3	1	1	2
PSO3	1	1	3	2	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Basics of Group Theory**	Periods	15
	Principles of group theory - Symmetry elements and Symmetry operations. Properties of group - Abelian, non Abelian, sub groups and cyclic groups. Group multiplication tables, Classes and similarity transformation. Molecular point groups – Determination of point group of molecules. Representation of groups - Matrix representation of symmetry elements, Reducible and irreducible representations. Properties of irreducible representation - Great orthogonality theorem and its consequences - Construction of character table for point groups (C_{2v}, C_{3V} and C_{2h}).		
Unit - II	**Applications of Group Theory**	Periods	15
	Standard reduction formula and conversion of reducible representation and irreducible representation, direct product representation. Hybridization schemes for atoms in molecules of different geometry - AB_4 tetrahedral and AB_3 triangular planar. Symmetries of vibrational modes in non linear molecules (H_2O, NH_3 and BF_3). Selection rules for vibrational spectroscopy – IR & Raman active, mutual exclusion rule and electronic transitions in formaldehyde. Symmetry in crystals - Hermann - Mauguin symbols- . Space groups of crystals -Translational elements of symmetry – Comparison of crystal symmetry with molecular symmetry		
Unit - III	**Chemical Kinetics**	Periods	15
	Reactions in solution: Comparison between gas phase and liquid phase reactions. Effect of dielectric constant on reactions in solutions, effect of ionic strength on reactions in solutions - Primary salt effect. Influence of pressure on rates of reactions in solution - significance of volume and entropy of activations. Study of fast reactions: Flow methods, pulse methods and relaxation methods. Chain reactions – Stationary, non stationary chain and explosion, Explosive reaction of H_2O_2. Linear free energy relation - Hammett and Taft equation.		
Unit - IV	**Kinetics and Catalysis**	Periods	15

	Acid-base catalysis – Types and mechanism. Hammet and Bronsted equation, Acidity function – Hammett-Deyrup acidity function, Hammett-Zucker hypothesis – Catalysis in biological systems. Enzyme catalysis - Michaelis-Menten equation. Factors affecting enzyme catalysed reaction: substrate concentration, pH and temperature. Inhibition of enzyme catalyzed reaction.		
Unit - V	**Surface Chemistry**	Periods	15
	Adsorption - Types of adsorption. Physical Adsorption isotherm: Freundlich's adsorption isotherm, Langmuir's adsorption isotherm, Brunauer-Emmett-Teller (BET) adsorption isotherm and its limitations. Heat of adsorption - Estimation of surface areas – B.E.T method, Point B method and radioactive tracer methods. Chemisorption: kinetics of chemisorption, surface reactions and their mechanisms. Difference between physical and chemical adsorptions.		
Total Periods			75

Text Books	
1	K.V. Raman, Group Theory, Tata McGraw - Hill Education (2004).
2	V.Ramakrishnan and M.S. Gopinathan, Group theory in chemistry, Vishal Publications, 1988.
3	A.S. Kunju, G. Krishnan, Group Theory and Its Applications in Chemistry, 2nd Edn, PHI learning private Ltd (2015).
4	B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co. (2016).
5	K.J. Rajaram and J.C. Kuriakose, Kinetics and mechanism of chemical transformations, Macmillan India Ltd (1993).
6	K.J. Laidler, Chemical Kinetics, Pearson (2009).
7	K. Veera Reddy, Symmetry and Spectroscopy of Molecules, New age international (2009).
8	Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014).
9	Gurudeep Raj, Surface Chemistry, Goel Publishing House, (2002).
References	
1	F.A. Cotton., Chemical Applications of Group Theory 2nd Edn, Wiley Eastern Ltd (1989).
2	Capellos and B.H.J. Bielski, Kinetic systems, Willey interscience, Newyork, 1968.
3	P.W. Atkins., Physical Chemistry, 6th Edn, Oxford University Press, (1998).
4	Alan Vincent, Molecular Symmetry and Group theory – Programmed Introduction to chemical applications, Wiley, Newyork, 1977.
E-References	
1	http://vlab.amrita.edu/?sub=2&brch=193&sim=1013&cnt=1
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						
Programme	**M.Sc**	Programme Code	**PCH**		Regulations	**2020-2022**	
Department	**Chemistry**		Semester			**2**	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
20P2CH04	CORE PAPER IV: Organic Reaction Mechanism	5			05	25	75	100
Course Objectives	1. To enrich the students knowledge in the field of reactions and reagents involved organic chemistry. 2. To impart knowledge in understanding the reaction conditions and mechanisms to arrive required product.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will learn the addition reactions taking place in the organic molecules.
CO 2	Students acquire deep knowledge on elimination reactions.
CO 3	Students can understand the path of different molecular rearrangements.
CO 4	Students will learn about the mechanism and applications of various naming reactions used in organic synthesis.
CO 5	Students will evaluate the role of reagents in organic synthesis.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
CO 2	2	PO 3	5
		PO 4	5
CO 3	2	PO 5	4
		PO 6	6
CO 4	4	PO 7	2
		PO 8	4
CO 5	5	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	2	2	1
PSO2	1	1	1	3	2
PSO3	2	2	2	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Addition reactions**	Periods	15
	Addition across C-C multiple bonds – Electrophillic, Nucleophillic, Free radicals, orientation and reactivity – Addition of halogen and nitrosyl chloride to olefin. Hydration of olefins and acetylenes. Epoxidation, Hydroboroation, Hydroxylation, Michael addition and Brich reduction. Diels Alder reaction, 1,3-dipolar additions. Carbenes, Nitrenes and their addition to double bond. Simmon-Smith reaction, Mannich, Stobbe, Darzen, Wittig, Wittig-Horner, Grignard, Thope and Benzoin condensation.		
Unit - II	**Elimination reactions**	Periods	15
	Elimination reactions – Mechanism of E1, E2 and E1CB – stereochemistry of elimination, Hofmann and Saytzeff rules – competition between Elimination and substitution – Pyrolytic – Cis elimination, Chugaev reaction – Typical reactions such as Dehydration, dehydrohalogenation, Hofmann degradation, Cope elimination – Bredt's rule.		
Unit - III	**Molecular rearrangements**	Periods	15
	A detailed study of the mechanism of the following rearrangements. Wagner – Meerwin, Demyanov, Dienone–Phenol, Favorski, Baeyer – Villiger, Wolff, Stevens, Von – Richter, Beckmann, Kornblum–DeLaMare, Smiles, Jacobsen, Neber, Fries, Ireland-Claisen, Hofmann–Martius rearrangements.		
Unit - IV	**Organic naming reactions and applications**	Periods	15
	A detailed study of the following naming reactions - Biginelli reaction, Hoeben – Hoesch reaction, Vilsmeyerformylation, Bucherer reaction, Pauson – Khand reaction, Heck reaction, Suzzuki, Stille, Sonogashira, Negishi, Cadiot–Chodkiewicz coupling reactions. Huigens synthesis. Baylis-Hillman, Luche, Yamaguchi.		
Unit - V	**Reagents for Organic synthesis**	Periods	15

	Aluminium chloride,Alumniumisopropoxide, N-Bromosuccinimide, OsO4, DCC, N-Chlorosuccinimide, Diazomethane, Fenton's reagent, Hydrogen peroxide, Lead tetraacetate, Lithium aluminium hydride, Perbenzoic acid, Periodic acid, Seleniun dioxide, Sodium borohydride, NaCNBH3, DDQ, Wilkinson catalyst, Wolff Kishner reagent, Wittig reagent.	
Total Periods		75

Text Books	
1	Jerry March, Advanced organic chemistry - Reactions mechanism and structure, McGraw Hill Kogakusha Ltd., 1977.
2	S.H. Mukhergee and S.P. Singh, Reaction mechanisms in organic chemistry, McMillan 1976.
3	Raj K.Bansal, Organic Chemistry Reaction mechanisms, Hill Publishing Company Ltd 2006
4	I.L. Finar, Organic chemistry, Vol. II. Pearson Education P Ltd 2011
References	
1	S. N. Sanyal, Reactions, Rearrangements and Reagents, Bharati Bhavan Publishers & Distributor 2011
2	V.K. Ahluwalia, Rakesh Kumar Parashar and R. K. Parashar, Organic Reaction Mechanisms Narosa Publishing House 2002
E-References	
1	https //www.name-reaction.com/list
2	https //www.synarchive.com/named-reactions

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				2	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P2CH05	CORE PAPER V: Chemical Bonding and Coordination Chemistry		5			05	25	75	100
Course Objectives	1. To impart the knowledge on types of bonding in simple and complex molecules. 2. To understand the concept of HOMO and LUMO, and their influence in bond formation.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will acquire sound knowledge on bonding in inorganic molecules.
CO 2	Students will learn the theories, mechanism of complex formation and the electronic spectra of coordination complexes.
CO 3	Students will acquire knowledge about term symbols and its applications.
CO 4	Students will analyze the bioinorganic molecules in coordination chemistry.
CO 5	Students will evaluate the various coordination theories.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
CO 2	3	PO 3	5
		PO 4	5
CO 3	2	PO 5	4
		PO 6	6
CO 4	4	PO 7	2
		PO 8	4
CO 5	5	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO3	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	3	2	2	1
PSO2	1	2	1	3	2
PSO3	2	1	2	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Ionic Bonding**	Periods	15
	Ionic bonding - Lattice energy - Born equation-Born-Haber cycle - Radius ratio rule - Born Mayer equation - Kapustinskii modification - energetics of the dissolution of ionic compounds in polar solvents - polarization-Fajan s rule - results of polarization. Electronegativity – determination -Types of chemical forces - effects of chemical forces - melting and boiling points, solubility.		
Unit - II	**Covalent Bonding and Molecular Structure**	Periods	15
	Covalent bonding Formal charges-Limitations of octet rule- Hybridization and geometry-VSEPR model of methane, ammonia, water, silicon tetrafluoride, AX_2 and AX_4 type, and some xenon compounds, Bent's rule - Failures of VBT-MO theory LCAO method-Molecular orbitals in homo nuclear diatomic molecules of oxygen, beryllium, nitrogen and carbon, hetero nuclear diatomic molecules such as HCl, NO and CO-HOMO and LUMO concepts in bonding.		
Unit - III	**Coordination Theories**	Periods	15
	CFT-Splitting pattern of d-orbital in various environments of ligands octahedral, tetrahedral, square - planar-CFSE-Factors affecting the magnitude of CFSE-Weak and strong fields-Pairing energy-Jahn Teller distortion - Nephlauxetic effect-Limitations of CFT-LFT-Evidence for covalent nature of metal-ligand bonds-pi-bonding theory-Construction of MO diagram for sigma and pi Oh complexes.		
Unit - IV	**Reaction Mechanism in Coordination Complexes**	Periods	15
	Stability of complexes, Thermodynamic and kinetic stability-stability constants-Substitution reactions-General mechanism-Schemes of octahedral, tetrahedral and square planar complexes-Trans effect-Theories of trans effect-pi-bonding theory and polarisation theory - Applications of trans effect-Catalysis by transition metal complexes, Hydrogenation of alkene-Wilkinson's catalyst, Hydroformylation - Oxo process, Wacker process and Zieglar-Natta catalysis.		

Unit - V	**Electronic Spectra and Organometallics**	Periods	15
	Spectroscopic term symbols for dn ions-derivation of term symbols and ground state term symbols-Energy level diagrams. Electronic spectra of complexes-Orgel diagram - interpretation of electronic spectra of d1 to d9-Tanabe-Sugano diagrams-charge transfer spectra-Carbonyls Binuclear and tri nuclear carbonyls of iron - preparation, properties, uses - Nature of M-CO bond in carbonyls - Nitrosyls-Nature of M-NO bonding - Metallocenes Ferrocene, Cobaltocene-Preparation, Properties and structure.		
Total Periods			75

Text Books	
1	J. E. Huheey, E. A. Keiter and R. L. Keiter., Inorganic Chemistry, 4th Edn, Pearson education 2006
2	R. D. Madan., Modern Inorganic Chemistry, Chand Publishers 2004
References	
1	C. N. Banwell., Fundamentals of Molecular Spectroscopy, Mc Graw Hill, Newyork 2001
2	R. Chang., Basic principles of Spectroscopy, McGraw Hill Ltd., New York, 1971
E-References	
1	http //chemed.chem.purdue.edu/genchem/topicreview/bp/ch8/vsepr.html
2	http//www.chem.iitb.ac.in/people/Faculty/prof/pdfs/L5.pdf

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**2**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P2CHP01	CORE PRACTICAL-I: Organic Chemistry Practical-I				5	04	40	60	100
Course Objectives	1. The objective of this lab is to provide hands-on opportunities to apply the knowledge of chemical reaction in functional group analysis. 2. It also gives hands-on training to synthesize organic compounds via a variety of organic reactions. 3. To promote the students towards research activity and job opportunities.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students can able to investigate and report an unknown compound systematically.
CO 2	Students will be known to synthesize, recrystallize and finding melting point of an organic compound. It will help them to carry out their research in future.
CO 3	Students can apply knowledge on identifying various functional groups.
CO 4	Students will analyze the various separation methods.
CO 5	Students can evaluate different binary organic mixtures.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	3	PO 1	2
		PO 2	1
CO 2	1	PO 3	5
		PO 4	5
CO 3	3	PO 5	4
		PO 6	6
CO 4	5	PO 7	2
		PO 8	4
CO 5	2	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	1	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO2	1	1	2	2	1	3	1	1	1	1	1	1	1	3	1
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO5	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	3	1	3	1	3
PSO2	2	1	2	2	2
PSO3	1	1	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Qualitative analysis of binary mixture of organic compounds :**	Periods	30
	Preliminary pilot analysis, pilot report, bulk separation, systematic analysis of each component inclusive of preliminary identification, confirmatory tests, derivative preparation and recording melting point/boiling point of components.		
Unit - II	**Single stage preparations**	Periods	45
	Single stage preparation of organic compounds involving synthetic methods like oxidation, acylation, nitration, sulphonation, Bromination, Esterification, hydrolysis and condensation (six preparations).		
Total Periods			75

Text books	
1	Antony J. Hannaford, Austin R. Tatchell, Brian S. Furniss, Peter W.G. Smith , Vogel's Text Book of practical organic chemistry, Pearson Education (2006).
References	
1	V. Venkateshwaran, R. Veerasamy, A. R. Kulandaivelu, Basic principles of practical chemistry, Sultan Chand & Sons,New Delhi, 2016
E-References	
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**2**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P2CHP02	CORE PRACTICAL II: Inorganic Chemistry Practical-I				5	04	40	60	100
Course Objectives	1. To acquire training in microscale experimental techniques. 2. To acquire knowledge on the properties of ions and their compounds. 3. To promote the students towards research activity and job opportunities							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will learn how to conduct a process systematically and precisely.
CO 2	The qualitative analysis gives a type of mental training and develops a power of reasoning not equal to any other course in chemistry.
CO 3	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.
CO 4	Students will analyze the use of complexometric titrations in water analysis
CO 5	Students will evaluate the rare cations using qualitative analysis.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	3
		PO 2	4
CO 2	3	PO 3	1
		PO 4	2
CO 3	1	PO 5	5
		PO 6	5
CO 4	1	PO 7	3
		PO 8	6
CO 5	1	PO 9	4
		PO 10	1
PSOs	KLs	PO 11	3
		PO 12	5
PSO 1	1	PO 13	2
PSO 2	1	PO 14	4
PSO 3	1	PO 15	6

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	**Programme Outcome (POs)**														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	2	3	1	1	2	1	1	2	2	1	3	1	1
CO2	3	2	1	2	1	1	1	1	2	1	3	1	2	2	1
CO3	1	1	3	2	1	1	1	1	1	3	1	1	2	1	1
CO4	1	1	3	2	1	1	1	1	1	3	1	1	2	1	1
CO5	1	1	3	2	1	1	1	1	1	3	1	1	2	1	1

CO / PSO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	1	3	3	3
PSO2	2	1	3	3	3
PSO3	2	1	3	3	3

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Complexometric titrations**	Periods	30
	Estimations of Ca, Cu, Mg, Ni & Zn using complexometric titration		
Unit - II	**Qualitative Analysis**	Periods	45
	Qualitative analysis employing semi micro methods and spot tests - mixtures of common cations and ions of the following less familiar elements Molybdenum, tungsten, selenium, tellurium, cerium, thorium, titanium, zirconium, vanadium, uranium and lithium.		
Total Periods			75

Text Books	
1	V.V. Ramanujam, Inorganic semi micro qualitative analysis, The National Publishing Co., Ltd., Madras 2002.
References	
1	Vogel, Inorganic quantitative analysis, Pearson Education 2001.
E-References	
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**2**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P2CHCP03	CORE PRACTICAL II: Physical Chemistry Practical - I				4	04	40	60	100
Course Objectives	To apply the principles of electrochemistry in the analysis of physical and chemical properties of the given compounds and develop laboratory skills and the ability to work with instruments independently.							

POs	**PROGRAMME OUTCOME**
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.

COs	COURSE OUTCOME
CO 1	Students will understand the breadth and concepts of physical chemistry.
CO 2	Students will develop skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
CO 3	Students will plan, conduct, review and report the experiment.
CO 4	Students will analyze the possible errors in phase studies.
CO 5	Students will evaluate the adsorption mechanism with time.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	3
		PO 2	1
CO 2	1	PO 3	4
		PO 4	2
CO 3	3	PO 5	6
		PO 6	6
CO 4	2	PO 7	2
		PO 8	1
CO 5	6	PO 9	1
		PO 10	4
PSOs	KLs	PO 11	5
		PO 12	3
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	1

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	**Programme Outcome (POs)**														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	2	1	3	1	1	1	2	2	1	1	2	2	1	2
CO2	1	3	1	2	1	1	2	3	3	1	1	1	3	1	3
CO3	3	1	2	2	1	1	2	1	1	2	1	3	1	1	1
CO4	2	2	1	3	1	1	1	2	2	1	1	2	2	1	2
CO5	1	1	1	1	3	3	1	1	1	1	2	1	1	3	1

CO / PSO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	3	2	1
PSO2	1	1	2	3	2
PSO3	2	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Electrical Experiments**	Periods	75
	i) Potentiometric titration a) HCl vs NaOH b) CH_3COOH vs NaOH c) HCl, CH_3COOH vs NaOH (mixture of acids) d) KCl vs $AgNO_3$ e) HI vs $AgNO_3$ ii. Determination of solubility product a. Galvanic cell method. b. Concentration cell method. iii. Estimation of mixture of halides (HI, KCl vs $AgNO_3$) iv. Determination of E^o, Zn^{2+}/ Zn and estimation of Zn^{2+}. v. Determination of hydrolysis constant (for aniline hydrochloride).		
Total Periods			75

Text Books	
1	A .O. Thomas, Practical Chemistry, Scientific Book Centre, Cannanore (2003).
2	V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).
References	
1	B Viswanathan, P.S. Raghavan, Practical Physical Chemistry, Viva Books Private Limited, (2005).
E-References	
1	http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Material Science
2	http://www.cffet.net/sia-e/2_Pot_titr.pdf

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						
Programme	**M.Sc**	Programme Code	**PCH**		Regulations		**2020-2022**
Department	**Chemistry**		Semester				**1**
Course Code	Course Name	Periods per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
20P1CHE01	Elective: Nanoscience and Nanotechnology	4			4	25	75	100
Course Objectives	1. To introduce the students to the world of nanotechnology. 2. To enrich the knowledge of students in novel synthetic methods to prepare nanoparticles.							

POs	**PROGRAMME OUTCOME**
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.

COs	COURSE OUTCOME
CO 1	Students will acquire knowledge on various synthetic methods of nanoparticles and techniques to characterize them.
CO 2	Students will be able to understand various types of nanoparticles and their properties.
CO 3	Students learn about the promising applications of nanotechnology.
CO 4	Students will analyze the properties of various dimensional nanoparticles.
CO 5	Students will evaluate the recent advancements in nanotechnology.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	3
		PO 2	4
CO 2	3	PO 3	1
		PO 4	2
CO 3	1	PO 5	5
		PO 6	5
CO 4	1	PO 7	3
		PO 8	6
CO 5	1	PO 9	4
		PO 10	1
PSOs	KLs	PO 11	3
		PO 12	5
PSO 1	3	PO 13	2
PSO 2	4	PO 14	4
PSO 3	2	PO 15	6

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	**Programme Outcome (POs)**														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	2	3	1	1	2	1	1	2	2	1	3	1	1
CO2	3	2	1	2	1	1	1	1	2	1	3	1	2	2	1
CO3	1	1	3	2	1	1	1	1	1	3	1	1	2	1	1
CO4	1	1	3	2	1	1	1	1	1	3	1	1	2	1	1
CO5	1	1	3	2	1	1	1	1	1	3	1	1	2	1	1

CO / PSO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	3	1	1	1
PSO2	1	2	1	1	1
PSO3	3	2	2	2	2

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Introduction to Nanoscience**	Periods	15
	Introduction - history - nanoscale & nanotechnology - nanotech Generation - nanoscience - nanocomposites - zero dimensional nanomaterials - one dimensional nanomaterial - two dimensional materials - three dimensional nanomaterials. Indian and global scenario in nanotechnology.		
Unit - II	**Synthesis of Nanomaterials**	Periods	15
	Physical methods - Physical Vapour Deposition (PVD). Chemical methods-Thermolysis-sonochemical approach, CVD, Electrodeposition. Precipitation methods-Thermal decomposition of complex precursors, Reduction method, sol-gel, Hydrothermal, Solvothermal method.		
Unit - III	**Characterizations of nanomaterials**	Periods	15
	X-ray Diffraction (XRD), Thermal gravimetric analysis (TGA), Differential Scanning Calorimetry (DSC), UV spectroscopy, Photo Electron Spectroscopy (XPS). Electron Microscopy: Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM). Morphological: SAED analysis, Atomic Force Microscopy (AFM).		
Unit - IV	**Properties and Applications of Nanaoparticles**	Periods	15
	Size dependence of Properties - Chemical Reactivity – Solubility - Melting point - Electronic energy levels - Bohr radius. Optical properties - surface plasmon resonance, Quantum size effects. Magnetic properties - size dependent properties such as coercivity and saturation magnetization. Applications: Medicine, Nanoelectronics, batteries, environmental protection, food and agriculture, energy, nanomaterial based products. Risks of nanomaterials.		
Unit - V	**Nano biomaterials**	Periods	15
	Introduction: Biological building blocks - size of building blocks and nanostructures - protien nanoparticles. Nucleic Acids - DNA Double Nanowire, Genetic code and protein synthesis - Biological nanostructures - Multilayer films. Biopolymers, Biomaterials.		
Total Periods			75

Text Books	
1	Mark Ratner,Daniel Ratner, Nanotechnolgy, Pearson Education,Inc.2007
2	G.Schmid Eds,Nanoparticles, Wiley-VCH, 2004.
3	G.HodesEds, Electrochemistry of Nanomaterials, Wiley-VCH, 2001.
4	M.Kohler, W.Fritzsche, Nanotechnology, Wiley-VCH, 2004
References	
1	K.L.Choy, Process principles and applications of novel and cost- effective ESAVD based methods, World Scientific Publishing, Singapore, 2002
2	A.Jones and M.Mitchell, Nanotechnology-Commercial Opportunity, Evolution Capital Ltd. London, 2001.
3	Mick Wilson, Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology basic science and emerging technologies, overseas press
4	Charles P. Poole, Jr., Frank J. Owens, Introduction to Nanotechnology, Wiley reprint 2012
E-References	
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	nptel.ac.in/courses/103103033/module9/lecture1.pdf
5	http://folk.ntnu.no/fredrol/Nanomaterials%20and%20Nanochemistry.pdf

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**1**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P1CHE02	Elective: Instrumental Methods of Analysis		4			04	25	75	100
Course Objectives	1. To enable the students to handling of instruments. Acquire the fundamentals and principles of spectroscopic techniques. Enhance the knowledge in thermo and electro analytical methods.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will understand the fundamentals of molecular spectroscopy.
CO 2	Students will learn about the concepts of electronic spectroscopy.
CO 3	Students will apply their knowledge in absorption and emission spectroscopy.
CO 4	Students will analyze the various electro analytical methods.
CO 5	Students can evaluate the thermal stability of various materials using TGA.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	4	PO 1	5
		PO 2	2
CO 2	2	PO 3	2
		PO 4	1
CO 3	3	PO 5	1
		PO 6	5
CO 4	5	PO 7	3
		PO 8	2
CO 5	1	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	4
		PO 12	6
PSO 1	3	PO 13	5
PSO 2	4	PO 14	1
PSO 3	1	PO 15	4

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	1	1	1	2	2	1	1	2	3	1	2	1	3
CO2	1	3	3	2	2	1	2	3	2	2	1	1	1	2	1
CO3	1	2	2	1	1	1	1	2	1	3	2	1	1	1	2
CO4	3	1	1	1	1	3	1	1	1	1	2	2	3	1	2
CO5	1	2	2	3	3	1	1	2	3	1	1	1	1	3	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	3	2	1
PSO2	1	1	2	3	2
PSO3	2	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Fundamentals of spectroscopy**	Periods	15
	Electromagnetic spectrum: Electromagnetic radiation - properties, wave parameters - interaction of light with matter - types of spectroscopy: Atomic & Molecular spectroscopy -Absorption and Emission spectra.		
Unit - II	**UV And IR spectroscopic techniques**	Periods	15
	UV-Visible spectroscopy - Principle, instrumentation - photocolorimeter and spectrophotometer. Infrared spectroscopy - principle, instrumentation - source - monochromator - cell - sampling techniques – detector and recorders.		
Unit - III	**Atomic absorption and emission spectroscopic techniques**	Periods	15
	Flame Spectroscopy, Atomic Absorption Spectroscopy (AAS): Principle, theory, instrumentation and application. Luminescence Spectroscopy, Fluorescence Spectroscopy: Principle, theory, instrumentation and application.		
Unit - IV	**Electro analytical methods**	Periods	15
	Polarography - principle - concentration polarization- dropping mercury electrode-advantage and disadvantage - convection, migration and diffusion currents - Illkovic equation(derivation not needed) and its significance - Amperometry - principle and uses.		
Unit - V	**Thermo analytical methods**	Periods	15
	Principles and instrumentation thermo gravimetric analysis and differential gravimetric analysis - characteristics and curves - factors affecting TGA and DTA curves- calcium oxalate monohydrate and silver nitrate- thermometric titrations-principle and applications.		
Total Periods			75

Text Books	
1	Gopalan .R, Elements of analytical chemistry, Sultan Chand, 2009.
2	Kaur, Instrumental methods of chemical analysis.
References	
1	Khopkar S.M, Analytical Chemistry, New Age International, 2006.
2	Skog.A and West .M, Fundamentals of analytical chemistry, Saunders College Publications, 2004.
3	Sharma B.K, Instrumental methods of chemical analysis God Publications, 2007.
4	Usharani. S, Analytical Chemistry, Macmillan, 2008.
E-References	

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**2**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P2CHE03	Elective: Electrochemistry and Photochemistry		5			04	25	75	100
Course Objectives	1. To impart the basic concepts electrochemistry. 2. To understand the application of electrochemistry and electrochemical cells. 3. To acquire knowledge about electrochemical reactions. 4. To enrich the students knowledge with the basic principles							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will understand the basic principles of electrochemistry and different types of electrochemical cells.
CO 2	Students will learn about the basic concepts of photochemistry and their importance in various fields.
CO 3	Students will apply their knowledge of photochemistry in the process taking place in biosystems.
CO 4	Students will analyze the various electrokinetic processes.
CO 5	Students will evaluate the theories of electrical double layer theories.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
CO 2	2	PO 3	5
		PO 4	5
CO 3	3	PO 5	4
		PO 6	6
CO 4	4	PO 7	2
		PO 8	4
CO 5	5	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	3	2	1
PSO2	1	1	2	3	2
PSO3	2	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Electro chemistry - I**	Periods	15
	Introduction to electrochemical cells-Types-Chemical cells with and without transferences-Concentration cells- types- electrode concentration cells-electrolytic concentration cells - with and without transferences - liquid junction - salt bridge - derivation- Electrical double layer, theories of double layer -Electrokinetic phenomena: Electroosmosis – electrophoresis - Diffusion, Streaming and Sedimentation potentials - electro-capillary phenomena, electro-capillary curve–electrochromism- electrochemical noise.		
Unit - II	**Electro chemistry - II**	Periods	15
	Debye - Huckel theory of inter-ionic attraction, ionic atmosphere, time of relaxation, relaxation and - phoretic effects, Derivation of Debye-Huckel-Onsagar equation and its validity for dilute solutions at appreciably concentrated solutions. Debye-Falkenhagen and Wein effects. Mean ionic activity coefficients and their determination. Debye – Huckel Bronsted equations - Derivation of Debye-Huckel limiting law, Quantitative and qualitative verification, ion association and Bjerrum theory.		
Unit - III	**Photochemistry**	Periods	15
	Absorption of light and nature of electronic spectra, electronic transition, Frank-Condon principle, selection rules, photodissociation, predissociation, photochemical reactions: photoreduction, photo-oxidation, photodimerization, photochemical substitution, photoisomerization – transition metal complexes - photochemistry of environment: Green house effect. Photo physical phenomena: Electronic structure of molecules, molecular orbital, electronically excited singlet states, designation based on multiplicity rule, life time of electronically excited state, construction of Jablonski diagram. Stern-Volmer equation, critical energy transfer distances, energy transfer efficiency, examples and analytical significance, bimolecular collisional quenching.		
Unit - IV	**Organic Photochemistry**	Periods	15

	Fundamental concepts - Photooxidation reaction (Formation of Peroxy compounds) – Photoreduction of ketones and enones, Norrish type I and II reactions-Photochemistry of Alkenes, Dienes and Aromatic compounds - Photoisomerisation – Cis and Trans isomerization - Photoaddition reaction-Paterno-Buchirreaction-Barton reaction Photo–Fries rearrangement and photorearrangement of 2,5-Cyclohexadienones.		
Unit - V	**Applied Photochemistry**	Periods	15
	Photochemistry reaction in the atmosphere - oxygen and ozone - nitrogen oxide - chlorofluoro carbons - organic compounds - chemistry of vision – photography - photosensitisers-ultraviolet screening agents - optical bleach – photochronism - photoimaging - photochemistry of polymers - Photo polymerization: imaging, curing - photodegradation and photostabilization–photosynthesis - photochemistry of excited redox reactions- solar energy conversion and storage.		
Total Periods			75

Text Books	
1	K. K. Rohatgi - Mukharjii, Wiley Eastern., Fundamentals of Photochemistry, New age international., P Ltd., New Delhi 2011
2	S. Glasstone, D. Van Nostrand., An introduction to Electrochemistry., Affiliated East west press Pvt., Ltd., New Delhi, 2004
3	Gurdeep Raj, Advanced Physical Chemistry, Go Publishing House.1999
4	Jagdamba singh, Jaya singh, Photochemisty & Pericyclic Reaction, New age international publishers 2012
References	
1	M.S Yadav Electrochemistry- Anmol Publication Pvt Ltd. New Delhi, 2011
2	J.G.Calverts & J.N.Pitts - An introduction to Photochemistry, New age international p Ltd., New Delhi. Wells.
E-References	
1	http //www.engr.uconn.edu/~jmfent/CHEG320_electrochemistry%20lectures.pdff33079
2	https //web.stanford.edu/group/burnslab/meetings/13_01_24_QOphotochemistry.pdf

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**2**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P2CHE04	Elective: Organic Spectroscopy		4			04	25	75	100
Course Objectives	To enable the students to identify the organic compounds. Acquire the fundamentals and principles of spectroscopic techniques. Enhance the knowledge in mass, NMR, IR spectroscopy.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
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PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
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PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will understand the basic principles of UV visible spectroscopy.
CO 2	Students will learn about the basic concepts of IR spectroscopy.
CO 3	Students will apply their knowledge on interpretation of mass spectrum.
CO 4	Students will analyze the chemical shift in molecules using NMR.
CO 5	Students will evaluate the types of spectra.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	5
		PO 2	2
CO 2	3	PO 3	2
		PO 4	1
CO 3	2	PO 5	1
		PO 6	5
CO 4	1	PO 7	3
		PO 8	2
CO 5	4	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	4
		PO 12	6
PSO 1	3	PO 13	5
PSO 2	4	PO 14	1
PSO 3	1	PO 15	4

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	**Programme Outcome (POs)**														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	3	3	2	2	1	2	3	2	2	1	1	1	2	1
CO2	1	2	2	1	1	1	1	2	1	3	2	1	1	1	2
CO3	1	3	3	2	2	1	2	3	2	2	1	1	1	2	1
CO4	1	2	2	3	3	1	1	2	3	1	1	1	1	3	1
CO5	2	1	1	1	1	2	2	1	1	2	3	1	2	1	3

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	3	2	1
PSO2	1	1	2	3	2
PSO3	2	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**UV Visible Spectroscopy**	Periods	15
	Frank-condon principle, Types of electronic transitions, Chromophores & Auxochromes, absorption and intensity shifts, Factors influencing positions & intensity of absorption bands, Absorption spectra of dienes, polyenes & unsaturated carbonyl compounds, Woodward - Fieser rules.		
Unit - II	**IR Spectroscopy**	Periods	15
	Vibrational frequencies & factors affecting them, identification of functional groups, Finger Print Region, Significance of Far IR region.		
Unit - III	**Mass Spectrometry**	Periods	15
	Principle - EI, CI & FAB - Base peak, isotopic peaks, metastable peak, parent peak, Fragmentation - Nitrogen, even electron rule and pattern, McLafferty rearrangement, Retro – Diel's Alder reaction fragmentation pattern of hydrocarbons, alcohols, aldehydes and ketones.		
Unit - IV	**NMR Spectroscopy**	Periods	15
	Basic principles of NMR experiments - CW & FT NMR - ^{1}H NMR - Chemical Shift & Coupling constant - Factors influencing Proton Chemical Shift & Proton - Proton Coupling constant, AX & AB spin system - Spin decoupling - Nuclear Overhaust effect - Chemical exchange. ^{13}C NMR chemical shift & factor affecting ^{13}C Chemical shift.		
Unit - V	**Identification of organic compounds**	Periods	15
	Identification of organic molecules using UV, IR, NMR and Mass spectroscopic techniques.		
Total Periods			75

Text Books	
1	Finar .I.L, Organic Chemistry, Vol-I&II, Fifth Edition, ELBS Publication, 2006.
2	Sharma. Y.R, Elementary Organic Spectroscopy, Fifth Edition, S. Chand Publication, 2013.
3	Jag mohan, Organic Spectroscopy: Principles and Applications, Second Edition, Alpha Science International Ltd., Harrow, U.K.
References	
1	Dyer.J, Applications of Organic Spectroscopy, Prentice & Hall of India Pvt Ltd., NewDelhi, 1980.
2	Mukerjee.S.M & Singh.S.P, Organic Reaction Mechanism, McMillan India Ltd.,Chennai, 1990.
3	Kemp. W, Organic Spectroscopy, Mcmillan Ltd., 2001.
E-References	

Signature of BOS Chairman

QP CODE-20P1CH01

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

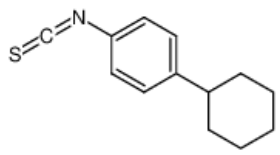
DEPARTMENT OF CHEMISTRY

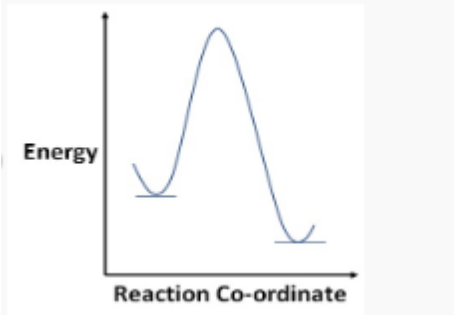
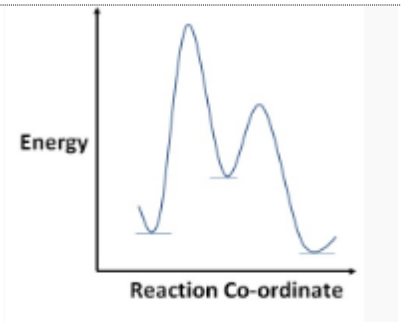
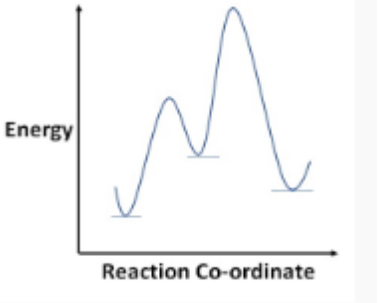
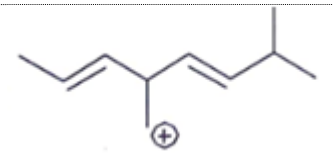
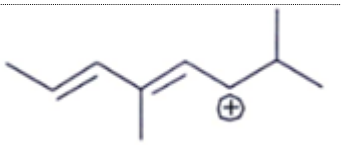
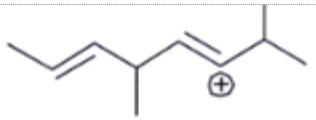
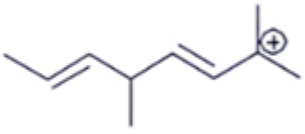
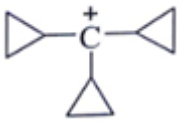
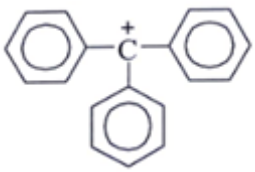
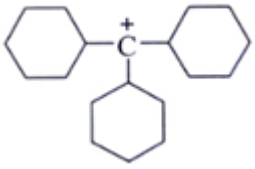
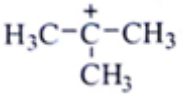
MODEL QUESTION PAPER

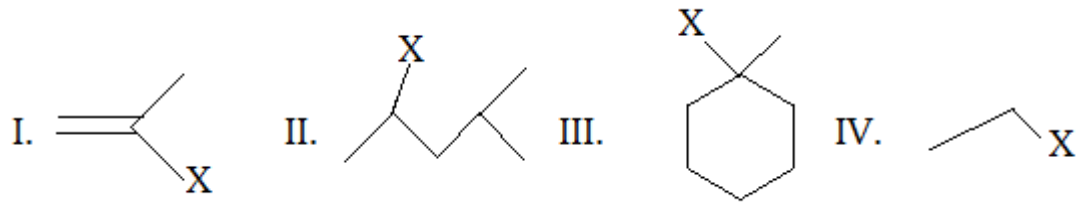
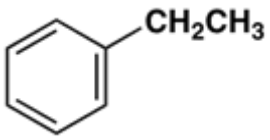
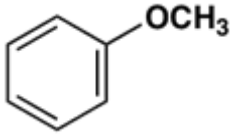
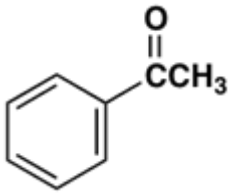
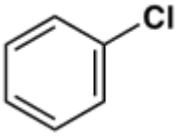
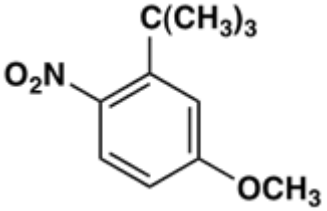
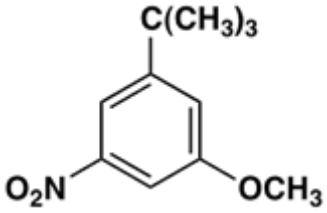
Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	CONCEPTS OF ORGANIC CHEMISTRY AND STEREOCHEMISTRY	I

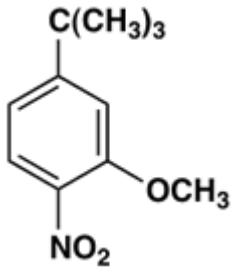
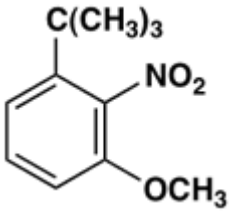
Time: 3 Hr. Max.Marks : 75

Section A
Answer all questions (20 x 1 = 10)

1	Predict the IUPAC name of the following compound. 				K1	CO-1
	A	1-cyclohexyl-4-isothiocyanato-benzene	B	1-cyclohexyl-4-thiocyanato-benzene		
	C	4-cyclohexyl-1-isothiocyanato-benzene	D	4-cyclohexyl-1-thiocyanato-benzene		
2	Which of the following statement about cinnoline is correct?				K1	CO-1
	A	Heterocyclic containing N & S and antiaromatic	B	Heterocyclic containing N & S and aromatic		
	C	Heterocyclic aromatic containing two N atoms	D	Alicyclic containing two nitrogen atoms		
3.	Sydnone are five-membered pseudo-aromatic heterocyclic molecule.				K1	CO-1
	A	six-membered, pseudo-aromatic heterocyclic molecule	B	five-membered, pseudo-aromatic heterocyclic molecule		
	C	six-membered, aromatic heterocyclic molecule	D	five-membered, aromatic heterocyclic molecule		
4	An example of homoaromatic compound is …….					
	A	cycloheptatrienyl cation	B	tropylium cation	K1	CO-1
	C	cyclopropenyl cation	D	cyclooctatrienyl cation		

5	Which of the following reaction coordinate diagram depicts the following reaction? $PhCMe_2Cl + OH^-$ ----------> $PhCMe_2OH + Cl^-$				K1	CO-2
	A		B			
	C		D	None of the above		
6	Which carbocation is the most stable?				K1	CO-2
	A		B			
	C		D			
7	Which one among the following carbocations has the longest half-life?				K1	CO-2
	A		B			
	C		D			
8	Which of the following method can be used to determine the reaction mechanisms?				K1	CO-2
	A	Intermediate trapping and cross experiments	B	Isotopic labelling		
	C	stereo chemical evidence	D	All of the above		

9	Which of the following compound shows the correct decreasing order of solvolysis with aqueous ethanol?  				K1	CO-3
	A	III > II > I > IV	B	III > II > IV > I		
	C	II > III > IV > I	D	III > I > IV > II		
10	Examples of ambient nucleophile and ambient substrate are …. ……., respectively				K1	CO-3
	A	Thiocyanate ion and 1,3-dichlorobutane	B	Nitrate ion and 1,3-dimethylbutane		
	C	Thiocyanate ion and 1,3-dimethylbutane	D	Nitrate ion and Thiocyanate ion		
11	The condition for aromatic nucleophilic aromatic substitution reaction is/are…..…….				K1	CO-3
	A	electron-poor aromatics	B	good nucleophiles		
	C	good leaving group	D	all of the above		
12	……. is a method for producing 2-aminopyridine derivatives by the reaction of pyridine with sodium amide				K1	CO-3
	A	Gattermann reaction	B	Chichibabin reaction		
	C	Gattermann Koch reaction	D	Reimer – Tiemann reaction		
13	Which is most reactive in electrophilic substitution?				K1	CO-4
	A	 	B	 		
	C	 	D	 		
14	Which is obtained as the main mononitration product upon reaction of *m*-*t*-butylanisole (1-*t*-butyl-3-methoxybenzene) with HNO_3-H_2SO_4?				K1	CO-4
	A	 	B	 		

	C		D			
15	Which of the following statements regarding electrophilic aromatic substitution is wrong?				K1	CO-4
	A	Acetyl and cyano substituents are both deactivating and *m*-directing.	B	Alkyl groups are activating and *o*,*p*-directing.		
	C	Ammonio groups are *m*-directing but amino groups are and *o*,*p*-directing.	D	Chloro and methoxy substituents are both deactivating and *o*,*p*-directing.		
16	An example of Michael addition reaction is				K1	CO-4
	A	Stork enamine reaction	B	Friedel craft acylation		
	C	Ziegler alkylation	D	Chichibabin reaction		
17	Which of the compounds below exists as only three stereoisomers?				K1	CO-5
	A	1,4-dibromobutane	B	2,3-dibromobutane		
	C	2,3-dibromopentane	D	1,1-dibromocyclopentane		
18	Enantiomers are ……				K1	CO-5
	A	mirror images and optically active	B	optically inactive compounds		
	C	stereoisomers	D	both A & C		
19	The reaction in which the starting materials differ only in their configuration are converted to stereoisomerically distinct products is called ……				K1	CO-5
	A	regioselective	B	chemoselective		
	C	stereospecific reaction	D	all of the above		
20	Consider the reaction of trans-2-butene with Br_2 in CH_2Cl_2. Which statement concerning this reaction is correct?				K1	CO-5
	A	The product is optically inactive because it is a racemic mixture of enantiomers.	B	The product is optically inactive because it is meso		
	C	The product is optically inactive because it does not possess any chirality centers.	D	The product is optically inactive because it is a racemic mixture of diastereomers.		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Predict the aromatic, non-aromatic and anti aromatic nature in the following compounds. (i) cycloheptatriene (ii) cyclobutadiene (iii) cyclooctatetrane (iv) cyclopentadienyl anion (v) pyridine			K2	CO-1

		OR		
	B	Explain Homoaromaticity and Anti aromaticity with examples	K2	CO-1
22	A	Give the order of stability of following carbocations and justify it. (i) tropylium ion (ii) Benzyl cation (iii) t-butyl carbocation (iv) Isopropyl carbocation (v) di-t- butyl carbocation	K2	CO-2
		OR		
	B	Explain the microscopic reversibility with example?	K2	CO-2
23	A	Explain S_Ni Mechanism.	K2	CO-3
		OR		
	B	Explain Gattermann reaction, Gattermann Koch reaction with mechanism	K2	CO-3
24	A	Give the mechanism of electrophilic substitution reactions	K2	CO-4
		OR		
	B	Explain the concept of orientation and reactivity using disubstituted benzene.	K2	CO-4
25	A	Explain regioselective transformation with examples.	K2	CO-5
		OR		
	B	Analyse the conformations of di-substituted cyclohexane.	K2	CO-5
Section C Answer ANY THREE Questions (3 x 10 = 30)				
26		Explain with example about effect of aromaticity on band length, resonance energy and induced ring current.	K3	CO-1
27		Explain stability, structure and generation of carbenes and nitrenes ?	K4	CO-2
28		Explain about the NGP in nucleophilic substitution reactions	K5	CO-3
29		Explain the mechanism of Stork Enamine reaction and Friedal Craft acylation of olifinic carbon.	K4	CO-4
30		Explain the optical inactivity of meso tartaric acid using Fischer, Newmann and Sawhorse projection formulas?	K3	CO-5

QP CODE-20P2CH04

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

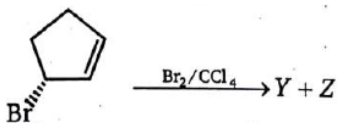
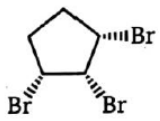
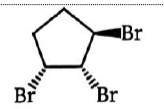
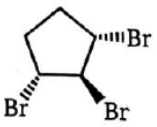
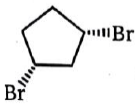
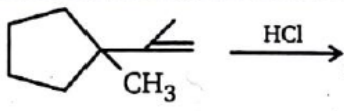
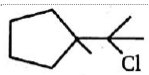
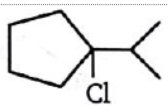
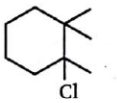
DEPARTMENT OF CHEMISTRY

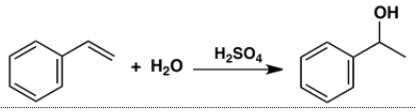
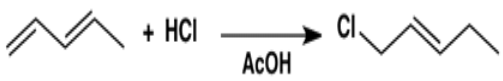
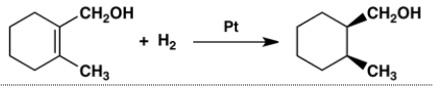
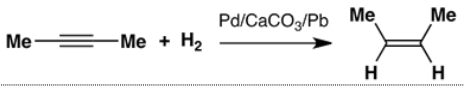
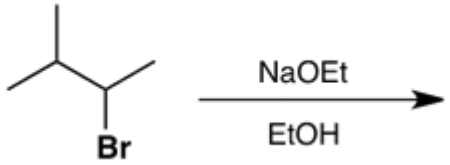
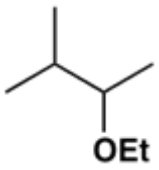
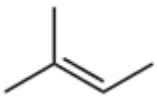
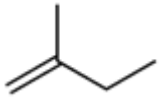
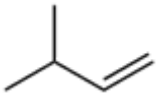
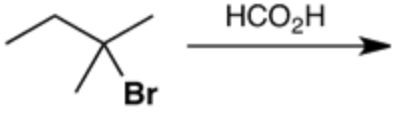
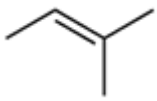
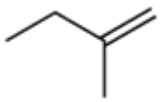
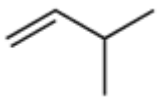
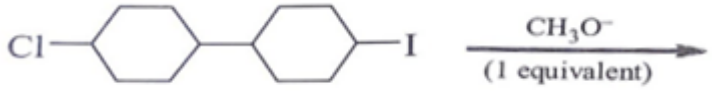
MODEL QUESTION PAPER

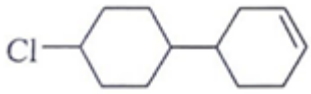
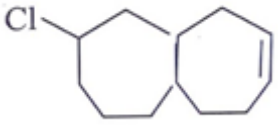
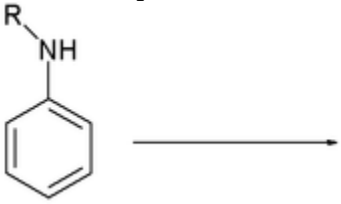
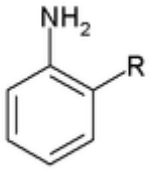
Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	ORGANIC REACTION MECHANISM	II

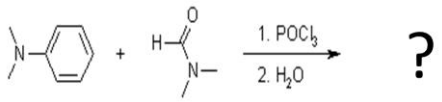
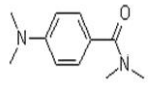
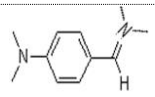
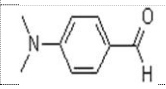
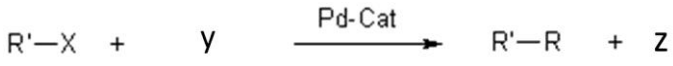
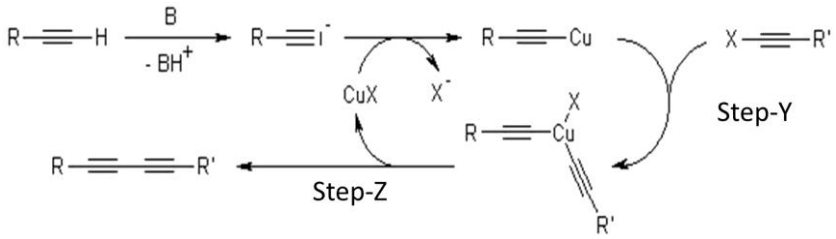
Time: 3 Hr. Max.Marks : 75

Section A
Answer all questions (20 x 1 = 20)

1	(R)-3-bromo cyclopentane reacts with Br_2/CCl_4 to form two products, y & Z, Y is not optically active. What is the structure of Y? 				K2	CO-1
	A		B			
	C		D			
2	Complete the following reactions: 				K1	CO-1
	A		B			
	C		D			
3.	Which of the following equations does not show the correct main products?				K3	CO-1

	A		B			
	C		D			
4	Which combination gives exclusive product as a result of addition reaction?				K1	CO-1
	A	Symmetrical reagent + unsymmetrical substrate	B	Br_2 + (Z) but-2-ene		
	C	Symmetrical reagent + symmetrical substrate	D	all of the above		
5	Which of the following statements regarding the E1 mechanism is wrong?				K3	CO-2
	A	Reactions by the E1 mechanism are unimolecular in the rate-determining step.	B	Reactions by the E1 mechanism are generally first order.		
	C	Reactions by the E1 mechanism usually occur in one step.	D	Reactions by the E1 mechanism are multi-step reactions.		
6	Which is the main product of the following reaction? 				K1	CO-2
	A		B			
	C		D			
7	Which is the main product of the following reaction? 				K2	CO-2
	A		B			
	C		D			
8	Predict the product for the following elimination reaction. 				K2	CO-2

	A		B			
	C		D			
9	A …….. rearrangement the hydrogen, alkyl or aryl group in a carbocation migrates from one carbon to a neighboring carbon resulting in 1,2-rearrangement reactions				K1	CO-3
	A	Martius rearrangements	B	Ireland-Claisen		
	C	Wagner–Meerwein	D	Baeyer – Villiger		
10	Predict the product of Martius rearrangements 				K4	CO-3
	A		B			
	C	Both A & B	D	None of the above		
11	Which of the following rearrangements uses allyl ester of a carboxylic acid in its silyl-stabilized enolate (silyl ketene acetal) form?				K1	CO-3
	A	Ireland-Claisen	B	Claisen Rearrangement		
	C	Cope Rearrangement	D	all of the above		
12	Which reaction uses peracids for the conversion of cyclic ketones to lactones				K4	CO-3
	A	Von – Richter	B	Baeyer – Villiger		
	C	Stevens	D	Neber		
13	The reaction which involves the reaction between β-keto ester, an aryl aldehyde, and urea to produce pyrimidones under acidic conditions is …… reaction.				K1	CO-4
	A	Vilsmeyer formylation	B	Negishi		
	C	Biginelli	D	Luche		
14	Predict the product of the following reaction:				K2	CO-4

						
	A		B			
	C		D	All of the above		
15	Complete the following stille reaction. 				K4	CO-4
	A	$Y=XSnBu_3$ & $Z=RSnBu_3$	B	$Y=XPtBu_3$ & $Z=RPtBu_3$		
	C	$Y=RSnBu_3$ & $Z=XSnBu_3$	D	None of the above		
16	Predict the Steps Y and Step Z in the following Cadiot–Chodkiewicz reaction 				K1	CO-4
	A	X = Oxidative addition & Y= Reductive elimination	B	X = Oxidative addition & Y = Reductive addition		
	C	X = Oxidative addition & Y = Oxidative elimination	D	X = Reductive addition & Y= Reductive elimination		
17	N-Bromosuccinimide is used for substitution of hydrogen at ……. carbon				K1	CO-5
	A	α-carbon to carbonyl	B	vinylic		
	C	allylic	D	all of the above		
18	The reagent DCC is used as ……				K2	CO-5
	A	oxidising agent	B	reducing agent		
	C	dehydrating agent	D	none of the above		
19	Selenium dioxide is mainly used to oxidize the ……carbon atoms adjacent to a double bond to form allylic hydroxy derivative				K2	CO-5
	A	α-methylene	B	β-methylene		
	C	carbonyl	D	terminal		
20	The Wilkinson catalyst is ……				K2	CO-5
	A	$[RuCl(PPh_3)_3]$	B	$[PdCl(PPh_3)_3]$		
	C	$[RhCl(PPh_3)_3]$	D	$[ReCl(PPh_3)_3]$		

	Section B **Answer All questions (5 x 5 = 25)**			
21	A	Addition reaction of alkenes leads to trans product. Why?	K2	CO-1
		OR		
	B	Write a note on hydroboration.	K2	CO-1
22	A	Discuss E1CB mechanism.	K2	CO-2
		OR		
	B	State and explain Hoffman and Saytzeff rule.	K1	CO-2
23	A	Write a notes on DeLa mare rearrangement.	K1	CO-3
		OR		
	B	Discuss the Neber rearrangement.	K3	CO-3
24	A	Explain Biginelli reaction.	K1	CO-4
		OR		
	B	Write a notes on Pauson-Khand reaction	K4	CO-4
25	A	Explain the role of $AlCl_3$ in Friedal Craft's reaction and Fries rearrangement.	K2	CO-5
		OR		
	B	Write the application of DDQ.	K4	CO-5
	Section C **Answer ANY THREE Questions (3 x 10 = 30)**			
26		Explain the following addition reaction with mechanism: (i) Simmon-smith reaction (ii) Wittig-Horner reaction	K1	CO-1
27		Give the mechanism of Cope elimination and Hoffmann degradation.	K2	CO-2
28		Explain Demyanov and Smiles rearrangement.	K2	CO-3
29		Explain the mechanism of Luche and Suzzuki reactions.	K2	CO-5
30		Explain the application of OsO_4 and $Pb(COOMe)_4$ in organic synthesis.	K1	CO-4

QP CODE-20P1CH02

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc., CHEMISTRY	TRANSITION METAL AND NUCLEAR CHEMISTRY	I

Time: 3 Hrs. Max.Marks : 75

Section A

Answer all questions (20 x 1 = 20)

1	Which of the following arrangements does not represent the correct order of the property stated against it?				K5	CO -1
	A	$V^{2+} < Cr^{2+} < Mn^{2+} < Fe^{2+}$: paramagnetic behaviour	B	$Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+}$: ionic size		
	C	$Co^{3+} < Fe^{3+} < Cr^{3+} < Sc^{3+}$: stability in aqueous solution	D	Sc < Ti < Cr < Mn : number of oxidation states		
2	…… among the following contain partially filled d – sub shell and does not show variable oxidation states.				K4	CO -1
	A	Zn	B	Cd		
	C	La	D	Hg		
3	Which one is of the following is the lightest transition element?				K1	CO -1
	A	Ti	B	Sc		
	C	Fe	D	Hg		
4	…….. has the maximum number of unpaired electrons.				K3	CO -1
	A	Fe^{2+}	B	Fe^{3+}		
	C	Co^{3+}	D	Co^{2+}		
5	Lanthanide contraction is caused due to,				K1	CO -2
	A	the appreciable shielding on outer	B	the appreciable shielding on outer electrons by 5d electrons from the nuclear		

		electrons by 4f electrons from the nuclear charge		charge		
	C	the same effective nuclear charge from Ce to Lu	D	the imperfect shielding on outer electrons by 4f electrons from the nuclear charge.		
6	Which of following radioactive elements in lanthanides				K1	CO -2
	A	Promethium (Pm)	B	Lutetium (Lu)		
	C	Yetterbium (Yb)	D	Samarium (Sm)		
7	The actinides exhibit more spread in place than the 4f orbital's				K2	CO -2
	A	The 5f orbital's are more spread in place than the 4f orbital's	B	Energy difference between 5f and 6d orbital is less than that of 4f and 5d orbital's.		
	C	Energy difference between 5f and 6d orbital is more than that of 4f and 5d orbital's.	D	Actinides are more reactive than that of lanthanides.		
8	Which one of these not magic no				K2	CO -2
	A	2	B	8		
	C	20	D	36		
9	One atomic mass unit is equal to				K1	CO -3
	A	931.5 eV	B	931.5 erg		
	C	931.5 MeV	D	1931.5 MeV		
10	Baryon contains				K1	CO -3
	A	1 quarks	B	2 quarks		
	C	3 quarks	D	4 quarks		
11	Which one is related to nuclear stability				K2	CO -3
	A	Binding energy	B	Magic no		

	C	N/P Ratio	D	All		
12	Alpha particle emission is explained with				K3	CO -3
	A	Binding energy	B	Nuclear tunnel effect		
	C	Nuclear isomerism	D	Auger effect		
13	Exoergic nuclear reaction				K3	CO -4
	A	Q = +ve	B	Q = -ve		
	C	Q = 0	D	None of the above		
14	Coulomb barrier is due to the……				K1	CO -4
	A	Projectile +ve target -ve	B	Projectile –ve target +ve		
	C	Projectile +ve and target +ve	D	None of the above		
15	Excitation function related to				K1	CO -4
	A	Choice of the nuclear reaction	B	Incoming and outgoing projectile beam		
	C	Both A and B	D	None of the above		
16	After beta decay parent nucleus shows atomic no				K2	CO -4
	A	-1	B	+1		
	C	-2	D	No change		
17	Which one is not a characteristics of nuclear fission				K1	CO -5
	A	Every step two are more lighter nuclei are produced	B	Every step two are more neutrons are produced		
	C	Nuclear chain reaction happened	D	No radiation formed		
18	The following radioactive isotope is used in agricultural process				K1	CO -5
	A	N13	B	P32		
	C	C 12	D	O16		
19	Which one is a detection and measurement technique of radioactive material?				K3	CO -5
	A	Cloud chamber	B	Geiger-Muller counter		

		method				
	C	Scintillation counter	D	All the above		
20	The half life period of $_6C^{14}$				K2	CO -5
	A	4352 years	B	5568 years		
	C	8564 years	D	1432 years		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Write the structure of $(Re_2 Cl_8)^{2-}$ and $(Mo_6Br_8)^{4+}$			K1	CO – 1
		OR				
	B	Write short note on colour and magnetic properties of d block elements with example.			K2	CO – 1
22	A	Explain about properties of inner transition elements.			K1	CO – 2
		OR				
	B	Write causes and consequences of gadolinium break.			K3	CO – 2
23	A	Briefly explain nuclear stability.			K4	CO – 3
		OR				
	B	What is semi empirical formula? Explain the terms.			K2	CO – 3
24	A	Write note on nuclear isomerism.			K1	CO – 4
		OR				
	B	Explain scintillation detector.			K1	CO – 4
25	A	What are fissile and fertile nuclides? Give examples.			K2	CO – 5
		OR				
	B	Write short note on application of radioactive isotopes.			K1	CO – 5
	Section C **Answer ANY THREE Questions (3 x 10 = 30)**					
26		Briefly explain about general characteristics of d block elements.			K1	CO – 1
27		Write short note on extraction of thorium.			K3	CO – 2

28		Explain i) Binding energy ii) Magic number iii) Meson theory	K2	CO – 3
29		Explain the following detection methods i) cloud chamber ii) scintillation detector	K4	CO – 4
30		Briefly explain the term nuclear fission and nuclear fusion reaction.	K1	CO – 5

QP CODE- 20P2CH05

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	CHEMICAL BONDING AND COORDINATION CHEMISTRY	II

Time: 3 Hrs. Max.Marks : 75

Section A
Answer all questions (20 x 1 = 20)

1	Which of the following molecule have ionic bond?				K1	CO-1
	A	O_2	B	Cl_2		
	C	NaCl	D	SO_2		
2	Which factor is used to determine if a bond is consideredionic a) c) d)				K1	CO-1
	A	Electronegativity	B	mass		
	C	size	D	number of atoms bound.		
3	Which element in periodic table possess highest electronegativity				K1	CO-1
	A	Hydrogen	B	Carbon		
	C	Fluorine	D	Helium		
4	Which element in periodic table possess highest electronegativity next to fluorine				K3	CO-1
	A	Pb	B	O_2		
	C	Ba	D	Ag		
5	What kind of hybrid orbitals are utilized by the carbon atom in CH_4 molecules?				K2	CO-2
	A	sp^2	B	sp^3		
	C	sp	D	d^2sp		
6	Which one of the following violate the octet rule?				K2	CO-2
	A	AsF_5	B	NF_3		

	C	PCl_3	D	CBr_4		
7	Carbon monoxide has ten bonding electrons and four antibonding electrons. Therefore it has a bond order of,				K3	CO-2
	A	3	B	7		
	C	1	D	2		
8	The atoms in water molecule adopt what kind of geometry if you include the lone pair of electrons?				K2	CO-2
	A	Linear	B	Tetrahedral		
	C	Pyramidal	D	Octahedral		
9	sp3 hybridization involves the hybridization of how many atomic orbitals?				K2	CO-3
	A	3	B	2		
	C	4	D	none 5 theabove		
10	The geometry of XeF_4 is _____ from the VESPR theory				K2	CO-3
	A	tetrahedral	B	angular		
	C	trigonalplanar	D	Square planar		
11	How many unpaired electrons are there in the strong field Iron(II) octahedral complex				K2	CO-3
	A	1	B	2		
	C	0	D	4		
12	Strong field ligands such as CN-				K4	CO-3
	A	usually produce low spin complexes and high crystal field splittings.	B	usually produce high spin complexes and small crystal field splittings.		
	C	cannot form low spin complexes	D	usually produce low spin complexes and small crystal field splittings.		
13	Which one of the following complexes can exhibit geometrical isomerism?				K1	CO-4
	A	[Pt(NH3)2Cl2] (square planar)	B	[Zn(NH3)2Cl2] (tetrahedral)		
	C	[Cu(CN)2]- (linear)	D	[Cu(NH3)4]2+ (square planar)		
14	Which one of the following complexe can exhibit cis isomer? a) b) c d				K1	CO-4
	A	[Pt(NH3)2Cl2]	B	[PtCl4]		
	C	[Cu(Cl)2]-	D	[Pt(NH3)4]2+		
15	Which one of the following complexes can exhibit transisomer?				K2	CO-4
	A	[Pt(NH3)2Cl2]	B	[PtCl4]		
	C	[Cu(Cl)2]-	D	[Pt(NH3)4]2+		
16	Organometallic chemistry is a branch of chemistry deals with compounds possessing……				K2	CO-4

	A	Carbon-CarbonBond	B	Metal-Metal Bond		
	C	Metal-CarbonBond	D	Metal-BoronBond		
17	The multiple bond character of the metal-carbon bond in metal carbonyls is du to the presence of…….				K2	CO-5
	A	Carbon-CarbonBond	B	Metal-Metal Bond		
	C	Hydrogen Bonding	D	Backbonding		
18	Atomic states are well described by the term symbols of the form……				K1	CO-5
	A	$^{J+1}L_{2S+1}$	B	$^{J}L_{2S+1}$		
	C	^{2S+1}LJ	D	$^{2S}L_{J}$		
19	The ground state term symbol for Fluorine (2p5 system) is				K2	CO-5
	A	$^{2}P_{3/2}$	B	$^{2}P_{5/2}$		
	C	$^{3}P_{3/2}$	D	$^{2}S_{3/2}$		
20	The oxidation state of Ferrocene (Fe(C5H5)2) is				K3	CO-5
	A	3+	B	0		
	C	2+	D	4+		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	State and explain Fajan's rule with an example			K4	CO-1
		OR				
	B	Describe radius ratio rule.			K3	CO-1
22	A	Explain hybridization and geometryofNH3.			K2	CO-2
		OR				
	B	What are the failures of VBT.			K4	CO-2
23	A	State and explain John Teller distortion with an example.			K1	CO-3
		OR				
	B	Describe splitting of d-ordbitals in square planar geometry			K4	CO-3
24	A	Write a note on trans effect with an example			K3	CO-4
		OR				
	B	Discuss hydrogenation of alkene using wilkinson's catalyst.			K2	CO-4
25	A	(i) What is ground term for d2 system. (ii) Give selection rule for electronic spectra.			K1	CO-5
		OR				
	B	Draw and explain Orgel diagram of d3 system			K1	CO-5
	Section C **Answer ANY THREE Questions (3 x 10 = 30)**					

26		Write note on (i) Lattice energy (ii) Born-Habercycle	K3	CO-1
27		Explain LCAO method for molecular orbitals inO2.	K1	CO-2
28		Illustrate splitting of d-orbitals in octahedral and Tetrahedral geometry.	K3	CO-3
29		i) Differentiate thermodynamic and kinetic stability. (ii) Write notes on stability constant.	K1	CO-4
30		(i) Derive term symbol for d4 system. (ii) Explain charge transfer spectra with an example.	K2	CO-5

QP CODE- 20P1CH03

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	GROUP THEORY, KINETICS AND SURFACE CHEMISTRY	I

Time: 3 Hrs. Max.Marks : 75

Section A

Answer all questions (20 x 1 = 20)

1	Which one has higher symmetry?				K4	CO-1
	A	Square	B	Sphere		
	C	Rectangle	D	Cube		
2	Number of irreducible representations in C_{2h} is _____				K5	CO-1
	A	2	B	3		
	C	4	D	None of the above		
3	Irreducible representation is				K1	CO-1
	A	Basic representation	B	Reducible		
	C	Non reducible	D	Both A&C		
4	Point group of Benzene is_____				K5	CO-1
	A	D_{5h}	B	D_{6h}		
	C	D_{6d}	D	None of the above		
5	Number of vibrational modes in H_2O is				K5	CO-2
	A	2	B	3		
	C	6	D	9		

6	Number of faces in octahedron is				K2	CO-2
	A	6	B	8		
	C	10	D	12		
7	Point group of Rhombohedral is				K1	CO-2
	A	C 2/m	B	R 3m		
	C	P 6mm	D	I 23		
8	Nature of hybrid in AB_3 type molecule is				K5	CO-2
	A	sp^3	B	sp		
	C	dsp^2	D	None of the above		
9	The number of chain carrier is greater than unity. Such reactions are called as				K2	CO-3
	A	Chain reactions	B	Explosion		
	C	Stationary chain reactions	D	Non stationary reactions		
10	. _____equation is best applicable to study of free energy relation				K1	CO-3
	A	Tafel	B	Hammett		
	C	Free energy relation	D	None of the above		
11	A unimolecular reaction may have a _____ entropy of activation				K1	CO-3
	A	One	B	Zero		
	C	Three	D	Five		
12	The theory of pressure effects on rate was formulated by				K1	CO-3
	A	Van't hoff	B	Arrhenius		
	C	Lewis and Randall	D	Eigen		
13	The word catalysis was first used by				K1	CO-4

	A	Dobernier	B	Thenard		
	C	Berzelius	D	Both A & B		
14	Eobs of Arrhenius intermediates is _____				K3	CO-4
	A	$-U+E'_2$	B	E_2		
	C	$-U+E_2+E'_2$	D	$-U+E_2$		
15	If PH = 5, the rate of enzyme catalysed reaction is				K4	CO-4
	A	Increase	B	Decreases		
	C	Moderate	D	No changes		
16	_____inhibition of enzyme catalysed reaction is cannot be removed by dialysis				K1	CO-4
	A	Competetive	B	Non competitive		
	C	Uncompetetive	D	Irreversible		
17	Gas behaves _____ in Langmuir adsorption isotherm				K2	CO-5
	A	Uniform energetically	B	Ideally		
	C	Non ideally	D	None of the above		
18	Physical adsorption is usually observed				K2	CO-5
	A	Mobile surface	B	Inter surface		
	C	Both A & B	D	None of the above		
19	Adsorption curves are mathematically expressed as				K1	CO-5
	A	a=f(T)	B	a=f(T,P)		
	C	a=f(P)	D	P=f(T,A)		
20	_____ adsorption isotherm is valid over a certain range of pressure only				K2	CO-5
	A	Langmiuir	B	Type VII		
	C	Freundlich	D	Type V		
	Section B **Answer All questions (5 x 5 = 25)**					

21	A	Write briefly about improper axis of symmetry with an example.K-1	K1	CO-1
		OR		
	B	What are the rules of group?	K1	CO-1
22	A	Derive selection rule for IR spectra using group theory.	K3	CO-2
		OR		
	B	Determine hybrid orbitals in CH_4.	K3	CO-2
23	A	Explain the effect of dielectric constant on reaction rate in solution.	K4	CO-3
		OR		
	B	Derive rate constant for fast reaction by using temperature jump technique.	K2	CO-3
24	A	Describe about Bronsted catalysis Law.	K2	CO-4
		OR		
	B	Describe about Vant Hoff and Arrhenius intermediates.	K4	CO-4
25	A	List out the major difference between physical and chemical adsorption.	K2	CO-5
		OR		
	B	Describe the effect of temperature on adsorption.	K2	CO-5
		Section C **Answer ANY THREE Questions (3 x 10 = 30)**		
26		Deduce the character table for C_{2v} point group	K5	CO-1
27		Determine the number of vibrational modes in H_2O.	K5	CO-2
28		Explain the effect of ionic strength on reaction rate in solutions.	K4	CO-3
29		Explain the effect of substrate concentration, temperature and pH on enzyme catalyzed reactions.	K2	CO-4
30		Discuss briefly about Langmuir adsorption isotherm and its significances.	K2	CO-5

QP CODE-20P1CHE01

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	NANOSCIENCE AND NANOTECHNOLOGY	I

Time: 3 Hrs. Max. Marks : 75

Section A
Answer all questions (20 x 1 = 20)

1	Who coined the word 'nanotechnology'?				K1	CO1
	A	Eric Drexler	B	Richard Feynmann		
	C	Sumio Tijima	D	Richard Smalley		
2	Nanoscience can be studied with the help of...				K2	CO1
	A	quantum mechanics	B	Newtonian mechanics		
	C	macro-dynamics	D	geophysics		
3	With the help of _____, Robert F. Curl and others discovered fullerene				K1	CO1
	A	electron microscope	B	magnetic resonance		
	C	condensation technique	D	mass spectrograph		
4	Which of these historical works of art contain nanotechnology?				K1	CO1
	A	Lycurgus cup	B	Medieval stained glass windows in churches		
	C	Damascus steel swords	D	All of the above		
5	Carbon atoms make ____ type of bond with other carbon atoms.				K2	CO2
	A	covalent	B	ionic		
	C	metallic	D	hydrogen		

6	One of the advantages of sol-gel method is able to get uniform and _____ powder.				K1	CO2
	A	Micro size	B	Large size		
	C	Nano size	D	Small size		
7	What is the general name for the class of structures made of rolled up carbon lattices?				K1	CO2
	A	Nanorods	B	Nanotubes		
	C	Nanosheets	D	Fullerrods		
8	While synthesizing the nano cones the plasma temperature is above_____				K1	CO2
	A	1000ºC	B	1500ºC		
	C	2000ºC	D	2500ºC		
9	The size of a quantum dot is ____ nm.				K1	CO3
	A	5	B	10		
	C	50	D	100		
10	During DTA (Differential thermal analysis) what kind of reference material is used?				K1	CO3
	A	Chemically active	B	Physically active		
	C	Inert	D	Having catalytic property		
11	Thermal analysis is defined as _____				K2	CO3
	A	Measurement of concentration of materials as a function of temperature	B	Measurement of solubility of materials as a function of temperature		
	C	Measurement of physical properties as a function of temperature	D	Measurement of line positions of crystals as a function of temperature		
12	Graphene is a:				K1	CO3
	A	wide band-gap semiconductor	B	gapless-band semiconductor		
	C	not a semiconductor but behaves like graphite	D	a narrow bandgap semiconductor		
13	Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?				K2	CO4

	A	Size distribution	B	Specific surface feature		
	C	Quantum size effects	D	All the above		
14	What are the advantages of nano-composite packages?				K2	CO4
	A	Lighter and biodegradable	B	Enhanced thermal stability, conductivity and mechanical strength		
	C	Gas barrier properties	D	All the above		
15	Coating the nano crystals with the ceramics is carried that leads to _____				K2	CO4
	A	Corrosion	B	Corrosion resistant		
	C	Wear and tear	D	Soft		
16	_____is the field in which the nano particles are used with silica coated iron oxide iron oxide.				K3	CO4
	A	Magnetic applications	B	Electronics		
	C	Medical diagnosis	D	Structural and mechanical materials		
17	The genetic code translated the language of				K1	CO5
	A	Proteins into that of RNA	B	Amino acids into that of RNA		
	C	RNA into that of proteins	D	RNA into that of DNA		
18	By nano scale distribution of the _____ in matrix improves the life and performance				K3	CO5
	A	Carbide	B	Tungsten		
	C	Hydrides	D	Nitrites		
19	The synthesized magnetic nano particles from _____ have been found to self-arrange automatically.				K1	CO5
	A	Zinc	B	Copper		
	C	Iron	D	Zirconium		
20	Nano particles target the rare _____ causing cells and remove them from blood.				K3	CO5
	A	Infection	B	Fever		
	C	Tumour	D	Cold		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Write the difference between one and two dimensional nanomaterials.			K2	CO1
		OR				

	B	Sketch the steps involved in nanotech generation.	K2	CO1
22	A	Discuss about the synthesis of nanomaterial by sol-gel method.	K2	CO2
		OR		
	B	Briefly explain the synthesis of nanomaterials using electrodeposition process	K2	CO2
23	A	Explain the thermal gravimetric analysis.	K2	CO3
		OR		
	B	Write the applications of scanning electron microscopy.	K2	CO3
24	A	Discuss the applications of nanoparticles in food and agriculture.	K2	CO4
		OR		
	B	Write note on risks of nanomaterials.	K2	CO4
25	A	What are biopolymers and biomaterials? Explain with an example.	K2	CO5
		OR		
	B	Write short note on; Multilayer films.	K2	CO5
Section C Answer ANY THREE Questions (3 x 10 = 30)				
26		Explain Indian and global scenario in nanotechnology.	K5	CO1
27		Discuss about the synthesis of nanomaterial by PVD method.	K3	CO2
28		What is SAED analysis? Explain with examples	K4	CO3
29		Briefly explain the properties and applications of metal nanocomposites.	K5	CO4
30		Explain the terms; DNA double nanowire, Genetic code and protein nanoparticle.	K3	CO5

QP CODE-20P2CHE03

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

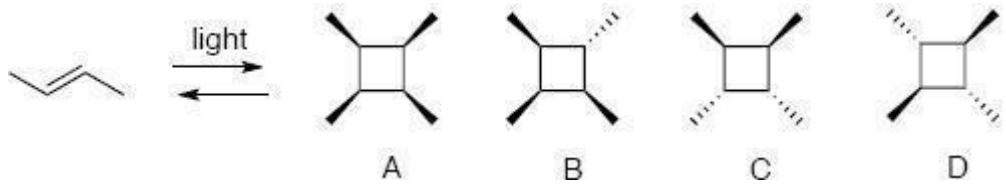
MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. CHEMISTRY	ELECTROCHEMISTRY & PHOTOCHEMISTRY	II

Time: 3 Hrs. Max.Marks :75

Section A
Answer all questions (20 x 1 = 20)

1	How can an electric double layer be formed around the solid particles of suspensions?				K2	CO-1
	A	The particles are charged as a matter ofcourse	B	As a result of the attractive forces acting between theparticles		
	C	Ions are adsorbed on the surface	D	As a result of the adsorption of a polar substances.		
2	The reverse ofelectro-osmosis				K3	CO-1
	A	zetapotential	B	Osmosis		
	C	iso-electric point	D	streaming potential		
3	In this equation $V_w=k \ln (C_g/C_0) + V_e$, where $V_e$is				K1	CO-1
	A	electrophoreticmobility	B	zetapotential		
	C	polarization	D	Poisson'svelocity		
4	Which method is not a sedimentationmethod?				K2	CO-1
	A	Ultracentrifugation	B	Sedimentation		
	C	Gelfiltration	D	Centrifugation		
5	Pick out the ionic strength for a solution of 0.10 MNaCl.				K3	CO-2
	A	0.2 M	B	0.5 M		
	C	0.1 M	D	0.25 M		
6	As the ionic strength, μ increases the activity coefficient(Y)				K2	CO-2
	A	increases	B	decreases		

	C	neutral	D	None of these		
7	Debye-Hückel theory is validonly				K1	CO-2
	A	Highconcentration	B	Higher concentration		
	C	Low concentration	D	non-ideal solution		
8	Which ion is kinetically inert?				K1	CO-2
	A	Cr^{2+}	B	Co^{3+}		
	C	Co^{2+}	D	Fe^{3+}		
9	A photochemical reaction is				K1	CO-3
	A	Catalyzed by light	B	initiated by light		
	C	accompanied with emission oflight	D	used to convert heat energy into light		
10	Photochemical reaction of trans-2-butene with itself will produce which of the following products? 				K3	CO-3
	A	A and B	B	C and D		
	C	Aand C	D	B and D		
11	Fluorescence is a slow processon				K1	CO-3
	A	10^{-9} to10^{-7}sec	B	10^{-8}to10^{-6}sec		
	C	10^{-3} to10^{-8}sec	D	10^{-9} to10^{-1}sec		
12	Photochemical reactions are independentof				K1	CO-3
	A	Pressure	B	Temperature		
	C	Free energy	D	All the above		
13	A photochemically-induced electrocyclic reaction involves which of a molecule's molecular orbitals?				K3	CO-4
	A	$HOMO^{-1}$	B	HOMO		
	C	LUMO	D	$LUMO^{+1}$		
14	Which of the following reactions converts an unsaturated ether to a γ,δ-unsaturated carbonyl compound?				K3	CO-4
	A	Coperearrangement	B	Claisenrearrangement		
	C	Photochemical[2+2]reaction	D	Diels-Alderreaction		
15	The transition in intersystem crossingis				K1	CO-4

	A	$S_1 \rightarrow T_1$	B	$T_1 \rightarrow S_0$		
	C	$S_0 \rightarrow S_n$	D	$T_1 \rightarrow S_0$		
16	Examples for Non-Equilibration of Excited Rotamersis				K2	CO-4
	A	1,3-cyclohexadiene	B	hexane		
	C	Fluvene	D	cyclohexane		
17	Example for atomicphotosensitizers				K1	CO-5
	A	Mercury	B	Nitrogen		
	C	Carbonmonoxide	D	Nickel		
18	Emission occurs at ordinary temperature, the emitted radiation is also known as				K2	CO-5
	A	Black light	B	Blue light		
	C	Cold light	D	White light		
19	The wavelength of X-ray is				K1	CO-5
	A	Below 0.1nm	B	10–200nm		
	C	360–800nm	D	0.1–10nm		
20	Systemic name for PLAis				K2	CO-5
	A	2-hydroxypropanoicacid	B	hydroxyester		
	C	polyesters	D	polyamides		
	Section B Answer All questions (5 x 5 = 25)					
21	A	Discuss the Chemical cells with and without transferences			K2	CO-1
		OR				
	B	Explain the Streaming and Sedimentation potentials.			K1	CO-1
22	A	What do you mean by Debye-Falkenhagen and Wein effects.			K2	CO-2
		OR				
	B	Explain the Quantitative and qualitative verification of Debye- Huckel limiting law.			K3	CO-2
23	A	Explain the construction of Jablonski diagram			K3	CO-3
		OR				
	B	Write a note on Frank- Condon principle and its selection rules.			K3	CO-3
24	A	Explain the formation ofperoxycompoounds.			K4	CO-4
		OR				
	B	Write a note on photo – fries rearrangement.			K2	CO-4
25	A	How will you explain the photosensitizers and chemistry of vision?			K1	CO-5

		OR		
	B	Explain photodegredation and photo stabilisation.	K2	CO-5
Section C Answer ANY THREE Questions (3 x 10 = 30)				
26		Explain the theories of doublelayer.	K4	CO-1
27		Derive the Debye - Huckel theory of inter-ionic attraction and ionicatmosphere.	K3	CO-2
28		What is mean by photochemical reactions and explain photo reduction and oxidation, Photodimerization.	K3	CO-3
29		Explain the Norish type I and norish type II with examples.	K3	CO-4
30		Explain the ultraviolet screening agents , optical bleach and photochronism	K4	CO-5

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						
Programme	**M.Sc**	Programme Code	**PCH**		Regulations	**2020-2022**	
Department	**Chemistry**		Semester			**3**	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
20P3CH06	CORE PAPER VI: Natural Products, Pericyclic reactions and Retro synthesis	5			05	25	75	100
Course Objectives	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.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students can learn about the chemical properties and structure of organic compounds like terpenoids, alkaloids, steroids and flavones etc derived from plant materials.
CO 2	Students can understand isolation, characterisation and laboratory synthesis of natural products.
CO 3	Student can know the concept of HOMO and LUMO, and their influence in bond formation.
CO 4	Students study the nature of double bonded compounds and the possible isomer arrived upon their rearrangement.
CO 5	Knowledge of student will be enriched with green chemistry and various types of eco-friendly reactions could be conducted on their own.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
CO 2	4	PO 3	5
		PO 4	5
CO 3	3	PO 5	4
		PO 6	6
CO 4	5	PO 7	2
		PO 8	4
CO 5	3	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO5	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	3	1	3
PSO2	1	3	2	2	2
PSO3	2	1	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Terpenoids and Steroids**	Periods	15
	Terpenes: classification, general structural elucidation, structural elucidation by chemical degradation and synthesis of α-pinene, camphor, zingiberene. Steroids: classification, structural elucidation of cholesterol (synthesis not required), stigmasterol (synthesis not required), structure and synthetic aspects of estrone and progesterone.		
Unit - II	**Alkaloids and Flavonoids**	Periods	15
	Alkaloids: classification, general structural elucidation, structural elucidation by chemical degradation and synthesis of papaverine, quinine, morphine and reserpine. Flavones: introduction and Baker-Venkatraman synthesis - Flavanol: synthesis of quercetin – Isoflavones: synthesis of daidzein.		
Unit - III	**Anthocyanins and Vitamins**	Periods	15
	Introduction to anthocyanins – synthesis of anthocyanins. structure and biological applications - uric acid, purine derivatives and xanthine bases Vitamins: introduction to fat and water soluble vitamins, structural elucidation of vitamin B6, vitamin B12, and vitamin K		
Unit - IV	**Pericyclic Reactions**	Periods	15
	Electrocyclic reactions (butadiene-cyclobutene system), cyclo-addition reactions ((4 +2) and (2+2)) systems, sigmatropic and cheletropic reactions, use of frontier molecular orbital and correlation diagrams, 1,3 and 1,5 - hydrogen shifts. Sigmatropic rearrangements: Claisen, Cope and oxy-Cope rearrangements.		
Unit - V	**Strategies for Synthesis**	Periods	15

	Retrosynthetic analysis: synthons and synthetic equivalents, functional group interconversion - disconnection approach – one group C-X, two group C-X and one group C-C disconnections - chemoselectivity, umpolung - protection and deprotection : alcohols, carbonyls, carboxylic acids and amino functional groups	
Total Periods		75

Text Books	
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.
4	Singh, Jagadamba and L.D.S .Yadav. *Advanced Organic Chemistry*.Meerut: Pragati Prakashan, 2010
References	
1	I.L. Finar organic Chemistry, Vol. II, 5th Edition ELBS 1975
2	O.P.Agarwal, Chemistry of Organic Natural products,Goel publication vol I & II
3	M.G. Arora, Organic Photochemistry and Pericyclic reaction,2008
4	C.H.Depuy ,O.SChampman Molecular reactions and Photo-chemistry, Prentice Hall, 1975
5	B.B. Grill, M. R. Willis, Pericyclic reactions, Champan & Hall 1974.
6	Jonathan, Clayden, Nick Greeves, Stuart Warren. Organic Chemistry. New York: Oxford University Press, 2012
E-References	
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**3**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P3CH07	CORE PAPER VII: Organometallic, Solid state, Spectroscopy and Bio-inorganic Chemistry		5			05	25	75	100
Course Objectives	To gain knowledge about Boron compounds, cages, chains and clusters. To learn elaborately in the field of solid state and bio-inorganic chemistry. To understand the working and application of various analytical tools to deduce crystal structure of solids.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students have the knowledge of application and properties of non aqueous solvents and formation of liquid and gaseous molecules.
CO 2	Students can able understand the commercial application of Organometallic Chemistry & catalysis.
CO 3	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.
CO 4	Students can know the importance of biologically important materials in our body.
CO 5	Students will have enriched knowledge on porphyrin and other bioinorganic molecules.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
CO 2	3	PO 3	5
		PO 4	5
CO 3	2	PO 5	4
		PO 6	6
CO 4	2	PO 7	2
		PO 8	4
CO 5	2	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO3	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO4	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO5	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	3	2	2	2
PSO2	1	2	1	1	1
PSO3	2	1	2	2	2

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Boron compounds and Clusters Boron hydrides**	Periods	15
	Inorganic chains - rings - cages and clusters - catenation - heterocatenation - intercalation chemistry - one dimensional conductor - isopolyanions - heteropolyanions - borazines - phosphazenes - phosphazene polymers - ring compounds of sulphur and nitrogen - homocyclic inorganic systems - cages - boron cage compounds - metal clusters - dinuclear clusters - trinuclear clusters - tetranuclear clusters - hexanuclear clusters - structural prediction of organometallic clusters.		
Unit - II	**Organometallic Chemistry & Catalysis**	Periods	15
	Carbon donors - Alkyls and Aryls-preparation and properties; Carbonyls -18 electron rule, isolobal concept - application to structure of carbonyls (simple and polynuclear); Nitrosyls - bridging and terminal nitrosyls, bent and linear nitrosyls; dinitrogen complexes; Chain Carbon donors - Olefins, acetylene and allyl complexes - synthesis, structure and bonding; Cyclic Carbon donors - Metallocene - synthesis, structure and bonding (Ferrocene only). Hydrogenation of olefins (Wilkinsons catalyst); hydroformylation of olefins using Cobalt or Rhodium catalysts (oxo process); Oxidation of olefins to aldehydes and ketones (Wacker process); polymerization (Zeigler-Natta catalyst); Cyclo oligomerization of acetylene using Nickel catalyst (Reppe's catalyst); polymer bound catalysts.		
Unit - III	**Solid State Chemistry**	Periods	15
	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.		
Unit - IV	**Atomic absorption, emission spectroscopy and Crystal Studies**	Periods	15
	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.		
Unit - V	**Bio-inorganic Chemistry**	Periods	15
	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 B12, In vivo and in vitro nitrogen fixation - Molecular mechanism of ion transport across the membrane - Na and K ion pumps-Chelate therapy-cis-platin.		
Total Periods			75

Text Books	
1	U. Malik, G. D. Tuli and R. D. Madan., Selected topics in Inorganic Chemistry, 6th EdnS. Chand & company Ltd., (2005).
2	B. R. Puri, L. R. Sharma and K. C. Kalia., Principles of Inorganic Chemistry, S. Chand & Co (2004).
3	R. D. Madan., Modern Inorganic Chemistry, Chand Publishers (2004).
References	
1	J. E. Huheey, E. A. Keiter and R. L. Keiter., Inorganic Chemistry, 4th Edn, Pearson education (2006).
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).
4	G. S. Manku., Theoretical Principles of Inorganic Chemistry, Tata McGraw –Hill Publishing Company Ltd., (Reprint 2001).
5	R. Chang., Basic principles of Spectroscopy, McGraw Hill Ltd., New York, (1971).
E-References	
1	global.oup.com/ushe/product/boron compounds-9780198502593
2	https://www.nature.com › subjects
3	https://www.chemie.uni-hamburg.de/ac/rehder/Lund_BioinorgChem_08.pdf

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						
Programme	**M.Sc**	Programme Code	**PCH**		Regulations	**2020-2022**	
Department	**Chemistry**		Semester			**3**	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
20P3CH08	CORE PAPER VIII: Quantum Chemistry and Thermodynamics	5			05	25	75	100
Course Objectives	To impart knowledge in the field of Quantum chemistry with applications. To enable the students to acquire knowledge on statistical thermodynamics. To understand the difference between classical and statistical thermodynamics							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will be able to identify wave functions using operators and recognize functions and values.
CO 2	Students will learn to perturbation and variation.
CO 3	Students can learn the concept of chemical potential, fugacity of gases, Activity and activity coefficient
CO 4	Students will learn the Objectives and various functions of Statistical thermodynamics
CO 5	Students acquire deep knowledge about the concept of non equilibrium and applications
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	3	PO 1	2
		PO 2	1
CO 2	2	PO 3	5
		PO 4	5
CO 3	2	PO 5	4
		PO 6	6
CO 4	2	PO 7	2
		PO 8	4
CO 5	2	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO4	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO5	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	3	2	2	2	2
PSO2	2	1	1	1	1
PSO3	1	2	2	2	2

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Quantum Chemistry-I**	Periods	15
	Quantum theory: Inadequacy of classical mechanics, Black body Radiation – Experimental results of Black body radiation – Photoelectric effect – De – Broglie equation – Heisenberg uncertainty principle – Compton effect. Born's interpretation of wave function. Operators and commutation relations, Eigen functions and Eigen values. Quantum mechanical postulates – Schrodinger equation and its solution to the problem of a particle in one and three dimensional boxes, the harmonic oscillator, the rigid rotator and Hydrogen atom (Arriving solution for energy and wave function). The origin of quantum numbers and their physical significance – Probability distribution of electrons. Approximation methods – Perturbation and Variation methods – application of Variation method to Hydrogen and Helium atom.		
Unit - II	**Quantum Chemistry-II**	Periods	15
	Theory of chemical bonding – Born – Oppenheimer approximation – LCAO – MO approximation for hydrogen molecule ion and Hydrogen – Valence Bond theory of Hydrogen molecule. Concept of Hybridization – sp, sp^2 and s^{p3} hybridization – Huckel Molecular orbital (HMO) theory for conjugated π- system – applications to simple systems (Ethylene and butadiene) – Physical Significance of HMO coefficients. Self consistent field approximation – Hartree and Hartree – Fock Self Consistant field theory – Slater type orbitals – Slater rules.		
Unit - III	**Thermodynamics - I**	Periods	15
	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.		

Unit - IV	**Statistical Thermodynamics**	Periods	15
	Objectives of Statistical thermodynamics, concept of thermodynamical and mathematical probabilities, Distribution of distinguishable and non distinguishable particles. Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics Law – comparisons. Partition Function – Translational, Vibrational, Rotational and Electronic partition Functions. Thermodynamic Functions in terms of partition Function, Statistical expression for equilibrium constant C. Calculation of Equilibrium Constant from Partition function (isotopic exchange equilibria and dissociation of diatomic molecules) Heat capacities of monoatomic crystals - Einstein s and Debye s theories of heat capacities.		
Unit - V	**Irreversible Thermodynamics**	Periods	15
	Reversible and Irreversible process – Types of irreversibility of process. Postulates of Non-Equilibrium thermodynamics. Entropy production - heat flow and matter flow. Progogine's principle of minimum entropy production. Forces, fluxes and Flows - Entropy production of forces and fluxes. Linear laws - Phenomenological law - Onsager reciprocal relation - proof by Microscopic reversibility - Electro kinetic phenomenon – Diffusion. Non-Equilibrium stationary states and Applications – Peltier effect.		
Total Periods			75

Text Books	
1	Arun Bahl, B. S.Bahl, G. D.Tuli., Essentials of Physical Chemistry, Multicolour Revised Edn, S. Chand and Company Ltd, (2008).
2	L. K. Nash., Chemical Thermodynamics, 2nd Edn, Addision Wesley Publishing (1976)
3	P.W. Atkins., Physical Chemistry, 6th Edn, Oxford University Press, (1998)
4	Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014).
References	
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	M.C. Gupta., Statistical Thermodynamics, Wiley Eastern Limited (1990)
6	I. N. Levine, Quantum Chemistry, 4th Edn., Prentice Hall India, (1994).
7	B. K. Sen., Quantum Chemistry Including Spectroscopy, Kalyani publishers (2004).
8	S. Glasstone., Thermodynamics for Chemists - East-west Press Pvt.Ltd, (2002).
9	
E-References	
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						
Programme	**M.Sc**	Programme Code	**PCH**		Regulations	**2020-2022**	
Department	**Chemistry**		Semester			**3**	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
20P3CHED01	ELECTIVE PAPER: Applied Polymer Chemistry	5			04	25	75	100
Course Objectives	To impart the knowledge in the field of polymer chemistry. To impart knowledge in the preparation of syndiotactic, atactic and isotactic polymers using Zeiler-Natta catalyst. To impart understanding in the field of processing of polymers. To explore the applications of various synthetic polymers.						

POs	**PROGRAMME OUTCOME**
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.

COs	COURSE OUTCOME
CO 1	Students enable to understand various methods of polymer preparation.
CO 2	Acquire knowledge about types of polymers and processing techniques.
CO 3	Students know Molecular weight determination of polymers.
CO 4	Students will analyze the various processing of polymers
CO 5	Students enable to understand importance of polymers used for commercial applications.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
CO 2	1	PO 3	5
		PO 4	5
CO 3	5	PO 5	4
		PO 6	6
CO 4	3	PO 7	2
		PO 8	4
CO 5	2	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO3	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO4	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO5	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	1	1	3	2
PSO2	1	1	2	2	1
PSO3	2	3	1	1	2

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Basic Concepts**	Periods	15
	Monomers, Polymers - natural, Semisynthetic, synthetic 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.		
Unit - II	**Co-ordination and co-polymerization**	Periods	15
	Kinetics, mono and bimetallic mechanism of co-ordination polymers. Advantages of Zeigler-Natta catalyst. Co-polymerization: Block and graft co-polymers, Types of co-polymerization. Reactivity ratio. Cross-linked polymers and their applications.		
Unit - III	**Molecular Weight and Properties**	Periods	15
	Importance of molecular weight – Average molecular weight - Number average, weight average and viscosity average molecular weights. Measurement of molecular weights-Viscosity, light scattering, osmotic and ultracentrifugation methods. Polymer structure and physical properties–crystalline melting point Tm. Glass transition temperature (Tg), Determination of Tg. Relationship between Tm and Tg.		
Unit - IV	**Polymer Processing**	Periods	15
	Compounding, processing techniques: calendering, die casting, rotational casting, film casting, injection moulding, blow moulding extrusion, moulding, thermoforming, foaming, reinforcing and fibre spinning. Plastics, thermoplastic and thermosetting polymers.		
Unit - V	**Preparation and applications of Commercial Polymers**	Periods	15
	Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins. Natural rubber and rubbers derived from butadiene, Buna-S. Functional polymers, Fire retarding polymers and electrically conducting polymers. Biomedical polymers–contact lens, dental polymers, artificial heart, kidney, skin and blood cells.		
Total Periods			75

Text Books	
1	V. R. Gowariker, N.V. Viswanathan and J. Sreedhar, Polymer Science, New Age Int., (1986).
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).
E-References	
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**3**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P3CHED02	ELECTIVE PAPER: Industrial Chemistry		5			04	25	75	100
Course Objectives	To impart knowledge on fermentation, pigments, oils and fats. To understand the industrial applications of chemistry. To give an idea for the student about drugs and explosives.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students enable to understand various fermentation processes.
CO 2	Acquire knowledge about different drugs and pharmaceutical aids.
CO 3	Students know about the types of pigments and its use.
CO 4	Students will analyze the applications of enamels, adhesives and explosives.
CO 5	Students enable to understand importance of oils and fats for commercial applications.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	3	PO 1	2
		PO 2	1
CO 2	1	PO 3	5
		PO 4	5
CO 3	5	PO 5	4
		PO 6	6
CO 4	3	PO 7	2
		PO 8	4
CO 5	2	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO3	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO4	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO5	3	2	1	2	1	1	1	1	2	2	2	3	2	1	3

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	1	3	2
PSO2	1	1	2	2	1
PSO3	2	3	1	1	2

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Fermentation**	Periods	15
	Introduction - Historical - Conditions favourable for fermentation. Characteristics for enzymes - short accounts of some fermentation processes – Manufacture of beer – sprits- wines and vinegar. Ethyl alcohol from molasses- Preparation of wash distillation- Alcohol from waste sulphite liquor.		
Unit - II	**Drugs, diagnostic reagents and pharmaceutics aids**	Periods	15
	Drugs: Definition sources of drugs – some important drugs – aspirin – phenacetin – paracetamol – penicillin – chlormycetin – structure – properties – uses. **Organic diagnostic reagents** – definition – uses – sodium diatrizoate, phenol red Evans blue, indigo carmine, methylene blue, xylose, Histamine and sodium benzoate - properties – uses. **Organic pharmaceutics aids** – Definition – preservatives – antioxidants – flavouring agents – colouring agents – sweetening agents - Emulsifying agents and stabilising agents – examples for each class – uses (structure and preparation not necessary)		
Unit - III	**Pigments**	Periods	15
	Definition – composition, characteristics and uses of white pigments - white lead, Zinc oxide Lithopone and TiO_2 – Blue pigments – Ultra marine blue, cobalt blue and iron blue – characteristics – uses. Red pigments – red lead –characteristics and uses. Green pigments – chrome green, Guigwet's green and chromium oxide – characteristics and their uses- Black pigments- Yellow pigments.		
Unit - IV	**Adhesives, Enamels and Explosives**	Periods	15
	Adhesives: definition – classification of adhesives – animal glue – preparation- uses – protein adhesives - starch adhesives – preparation – uses. **Enamels:** Introduction - Raw Materials – Manufacture and Applications **Explosives:** Introduction- Classification- preparation and uses of explosives- Nitro cellulose, TNT, Picric acid, Gun Powder, Cordite and Dynamite.		

Unit - V	**Oils and Fats**	Periods	15
	Introduction – distinction, properties- classification- vegetable oils, Manufacture of cotton seed oil and soybean oil- Refining of crude vegetable oils- coconut oil, palm oil- peanut oil- olive oil- castor oil- safflower oil. Analysis of oils and fats: Definition and determination of Saponification value, Iodine value and RM value.		
Total Periods			75

Text Books	
1	B.N. Charabarthy – "Industrial Chemistry", 1st Ed., Oxford and IBh Publishing, New Delhi.
2	B.K. Sharma – "Industrial Chemistry", 1st Ed., (1983), Goel Publication, Meerut.
3	Arun Bahl and B.S. Bahl – "Text Book of Organic Chemistry", 11th and 18th Ed., S. Chand, New Delhi, 2006.
4	Ghosh, Jayashree – "Text Book of Pharmaceutical Chemistry", 3rd Ed., S.Chand & Co. Ltd., New Delhi, 1999.
References	
1	V.P. Gowariker and N.V. Viswanathan – "Polymer Science", 1st Ed., Wiley Easter Pvt. Ltd., New Delhi.
2	Lakshmi. S – "Pharmaceutical Chemistry", 3rd Ed., (1995), Sultan Chand & Sons, New Delhi.
3	Rajasekaran, VN. – "Pharmaceutical Chemistry", 1st Ed., (2003), Sun Publications – Chennai.
4	Krishnamoorthy, P. Vallinayagan & K. Jaya Subramanian – "Applied Chemistry", 2nd Ed., (1999, 2001), Tata MaGraw-HillPublishing Co. Ltd., New Delhi.
E-References	
1	http://www.naturebioscience.com/molasses-fermentation.php
2	https://digital-photography-school.com/mastering-color-series-color-blue-in-photography
3	https://www.ilo.org/legacy/english/protection/safework/ghs/ghsfinal/ghsc1528.pdf

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**4**	
Course Code	Course Name	Periods per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
20P4CH09	CORE PAPER IX: Physical methods in Chemistry	5			05	25	75	100
Course Objectives	To make the students to understand the principles of vibrational and rotational spectroscopy. To acquire knowledge in the field of UV-Vis spectroscopy and its application to organic chemistry.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
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PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will learn about Electromagnetic radiation
CO 2	Students can understand the importance
CO 3	Students will learn about the theory of UV spectroscopy, Fluorescence Spectroscopy and its applications
CO 4	Students will analyze theory and applications of NMR and EPR spectroscopy
CO 5	Students will evaluate the molecular weight of the organic compounds
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	1	PO 1	2
		PO 2	1
CO 2	2	PO 3	5
		PO 4	5
CO 3	3	PO 5	4
		PO 6	6
CO 4	4	PO 7	2
		PO 8	4
CO 5	5	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	**Programme Outcome (POs)**														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	1	2	3	2	1
PSO2	1	1	2	3	2
PSO3	3	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Microwave spectra**	Periods	15
	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 – Linear and Symmetric top molecule.		
Unit - II	**Vibrational Spectra**	Periods	15
	Vibrational Spectroscopy: Vibrating diatomic molecule: energy of diatomic molecules as simple harmonic and Anharmonic 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.		
Unit - III	**UV and fluorescence Spectroscopy**	Periods	15
	UV-spectroscopy: Theory, Instrumentation, Beer-Lamberts Law, bands in UV-VIS spectrum. Electronic transitions – Types, selection rules, Characteristic absorption (λ_{max} and ε_{max}) Conjugated double bond – dienes, carbonyl compounds and aryl groups. Factors influencing absorption. Spectroscopic terms – Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift and Hypochromic shift and applications of UV. Fluorescence Spectroscopy – Principles, instrumentation and applications.		

Unit - IV	**NMR and ESR Spectroscopy**	Periods	15
	NMR Spectra: Theory, Instrumentation. Chemical shift - Factors affecting chemical shift, Shielding and deshielding mechanisms. Spin-spin coupling, Coupling constant – Geminal and Vicinal coupling constant, heteronuclear couplings, Nuclear Overhauser effect. Introduction to ^{13}C NMR, ^{19}F NMR, ^{31}P NMR and applications of ^{1}H NMR. ESR Spectroscopy – Theory, derivative curves, g values, Hyperfine splitting, Isotropic and anisotropic systems and Applications		
Unit - V	**Mass and Mossbauer Spectroscopy**	Periods	15
	Mass Spectroscopy: Theory, Instrumentation, Types of ions- Molecular ion, Fragment ion, rearrangement and Metastable ion, odd even ions. Molecular ion peak and Base peak. Determination of molecular formula - Nitrogen rule, ring rule - Isotopic abundance analysis - Fragmentation process: Retro Diels Alder rearrangement - Mclattery rearrangement - Double bond and ring equivalence. Fragmentation (alcohol, hydrocarbon, carbonyl compounds and nitro compounds). Mossbauer Spectroscopy: Line width - Isomer shift - Quadrupole interactions - Magnetic interactions, Structural elucidation of iron tin complexes.		
Total Periods			75

Text Books	
1	Y. R. Sharma., Elementary Organic Spectroscopy, Chand Publications (2007)
2	Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014)
3	R. Chang., Basic principles of Spectroscopy, McGraw-Hill Inc.,US (1971).
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)
References	
1	C. N. Banwell and E. M. McCash., Fundamentals of Molecular Spectroscopy, 4th Edn, Tata McGraw Hill, (2010).
2	B.R. Puri, L. R. Sharma, M. S. Pathania., Principles of Physical Chemistry, Vishal Publishing Co. (2016)
3	P. S. Kalsi., Spectroscopy of Organic Compounds, New Age International (2007)
E-References	
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/

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**4**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P4CHE05	ELECTIVE V: Environmental Chemistry		5			04	25	75	100
Course Objectives	To impart knowledge in the field of environment, pollution, water quality, water treatment, industrial, agricultural pollutants, water management and acquire knowledge on the structure of atmosphere.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will acquire sound knowledge of environmental chemistry
CO 2	Students learn the importance of water management
CO 3	Students will acquire knowledge about pollution from industries
CO 4	Students will acquire knowledge about pollution from agricultural wastes
CO 5	Students will evaluate the waste management
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	1	PO 1	2
		PO 2	1
CO 2	2	PO 3	5
		PO 4	5
CO 3	4	PO 5	4
		PO 6	6
CO 4	4	PO 7	2
		PO 8	4
CO 5	4	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	1	2	2	2	2
PSO2	1	1	3	3	3
PSO3	3	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Fundamentals of Environmental Chemistry**	Periods	15
	Concept of environmental chemistry, Composition of atmosphere, vertical temperature and vertical structure of the atmosphere. Environmental pollution: Types and sources of Pollutants - air, water and soil pollution. Prevention and control of pollutions. . Biogeochemical cycles C, N, P, S and O. Biological control of chemical factors in the environment.		
Unit - II	**Water Chemistry**	Periods	15
	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, Water quality parameters: pH, conductivity, TDS, DO, BOD and COD. Role of water in the environment- Hydrological cycle.		
Unit - III	**Industrial Pollutants**	Periods	15
	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.		
Unit - IV	**Agricultural Pollutants**	Periods	15

	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.		
Unit - V	**Waste Management and Recycling**	Periods	15
	Sources and classification of waste. 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 - Energy Recovery from Waste - Municipal waste into road making - Electricity from tannery waste - Vermicomposting - biogas – Plastic recycling techniques - Waste water and its treatment recycling of sewage - Removal of hazardous wastes from contaminated metals.		
Total Periods			75

Text Books	
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.
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.
E-References	
1	www.purdueglobal.edu/degree-programs/legal-studies/bachelor-environmental-policy-management
2	www.onlinecolleges.net/degrees/environmental-science

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**4**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P4CHE06	ELECTIVE VI: Corrosion Principles, Protection and Monitoring		5			04	25	75	100
Course Objectives	To provide an understanding of the corrosion principles and engineering methods used to minimize and prevent the corrosion. Understanding various corrosion processes, protection methods and materials selection with practical examples.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will acquire sound knowledge about corrosion and its types
CO 2	Students learn the importance of polarization and its causes
CO 3	Students will acquire knowledge about corrosion monitoring techniques
CO 4	Students will acquire knowledge about corrosion coating and prevention
CO 5	Students will evaluate the efficiency of corrosion inhibitor
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	1	PO 1	2
		PO 2	1
CO 2	2	PO 3	5
		PO 4	5
CO 3	4	PO 5	4
		PO 6	6
CO 4	4	PO 7	2
		PO 8	4
CO 5	4	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	1	2	2	2	2
PSO2	1	1	3	3	3
PSO3	3	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Basic Concepts of corrosion**	Periods	15
	Corrosion – Introduction – definition – consequences of corrosion. Theories of corrosion – dry corrosion – wet or electrochemical corrosion – difference. Corrosion rate expression. Forms of corrosion – Galvanic – crevice – pitting – intergranular – selective leaching – erosion – stress – hydrogen damage – their prevention.		
Unit - II	**Thermodynamics of corrosion**	Periods	15
	Thermodynamics – Change of Gibbs free energy. Pourbaix diagram of water, iron and aluminium – limitations of Pourbaix diagram. Polarization – measurement – causes of polarization. Concentration polarization – activation polarization – resistance polarization (Basic ideas only).		
Unit - III	**Corrosion monitoring techniques**	Periods	15
	Corrosion monitoring techniques – Weight loss method – hydrogen permeation studies – electrical resistance measurement – linear polarisation resistance – potentiodynamic and galvanodynamic polarization – electrochemical impedance spectroscopy.		
Unit - IV	**Corrosion prevention**	Periods	15
	Corrosion prevention – material selection – change of environment – proper design – anodic and cathodic protection – application of coatings – types of coatings. Hot dipping – metal cladding – cementation – electroplating – surface or chemical conversion coating – anodising – vitreous or porcelain enamel coating – paints (Basic idea only).		
Unit - V	**Corrosion inhibitors**	Periods	15
	Corrosion inhibitors – definition – types – chemical passivators – adsorption inhibitors – film forming inhibitors – vapour phase inhibitors – advantages of using inhibitors. Industrial application of inhibitors – inhibition of reinforcing steel in concrete, coal water slurries, cooling water system, acid solutions and oxygen scavengers. Green inhibition – definition.		
Total Periods			75

Text Books	
1	Raj Narayan, An introduction to metallic corrosion and its prevention, Oxford and IBH Publishing company (1983).
2	V.S. Sastri, Green corrosion inhibitor, John Wiley and Sons Inc., Publications (2011).
3	A. Ravikrishnan, Applied chemistry,Sri Krishna Publications (2007).
References	
1	Mars. G. Fontana, Corrosion Engineering, Tata McGraw – Hill publishing company Ltd. (1986).
2	B.K. Sharma, Industrial Chemistry, Vol. I & II, Krishna Prakashan (2014).
E-References	
1	https://www.materials.unsw.edu.au/study-us/high-school-students-and-teachers/online tutorials / corrosion / introduction/wet-and-dry-corrosion
2	https://onlinelibrary.wiley.com/doi/full/10.1002/maco.202011977
3	https://www.vea.org.uk/what-is-enamel/

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations		**2020-2022**
Department	**Chemistry**		Semester					**4**
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P4CHP04	CORE PRACTICAL-IV: Organic Chemistry Practical-II				5	04	40	60	100
Course Objectives	The objective of this lab is to provide hands-on training to estimate organic compounds. It also gives an idea to sort out a suitable method to estimate organic compounds of their interest. To train the students to conduct two stage preparation.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students can able to estimate quantitatively the give organic compound.
CO 2	Students can able to design a synthesis of new compound.
CO 3	Students can able to purify the synthesized compound.
CO 4	Students can able to propose the mechanism of chemical reactions
CO 5	Students will able to carry out their research in future.
Pre-requisites	

KNOWLEDGE LEVELS			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
Cos	KLs	POs	KLs
CO 1	3	PO 1	2
		PO 2	1
CO 2	6	PO 3	5
		PO 4	5
CO 3	3	PO 5	4
		PO 6	6
CO 4	5	PO 7	2
		PO 8	4
CO 5	3	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO2	1	1	2	2	1	3	1	1	1	1	1	1	1	3	1
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO5	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	3	1	3	1	3
PSO2	2	1	2	2	2
PSO3	1	1	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Organic Estimations and Spectral Interpretations**	Periods	35
	Estimation of phenol, Estimation of aniline, Estimation of methyl ketone, Estimation of glucose. Interpretation of IR and UV visible spectra of organic compounds (six in each case)		
Unit - II	**Two stage preparations**	Periods	40
	sym-Tribromobenzene from aniline (Bromination + Hydrolysis) p-nitroaniline from acetanilide (Nitration + Hydrolysis) Benzanilide from benzophenone (Beckmann rearrangement) m-nitroaniline from nitrobenzene (Nitration + Reduction) p-bromo acetanlide from aniline (Acetylation + Bromination)		
Total Periods			75

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
4	V. Venkateshwaran, R. Veerasamy, A. R. Kulandaivelu, Basic principles of practical chemistry, Sultan Chand & Sons,New Delhi, 2016
E-References	
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations		**2020-2022**
Department	**Chemistry**		Semester					**4**
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P4CHP05	CORE PRACTICAL-V: Inorganic Chemistry Practical-II				5	04	40	60	100
Course Objectives	To acquire training in micro scale experimental techniques. To acquire knowledge on the properties of ions and their compounds .To educate the students about the complex formation reaction, influence of pH, stability of complexes and application							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
PO 5	Ability to evaluate the reliability and relevance of evidence identify logical flaws and holes in the arguments of others analyse and synthesise data from a variety of sources draw valid Conclusions.							
PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will learn how to conduct a process systematically and precisely
CO 2	The qualitative analysis gives a type of mental training and develops a power of reasoning not equal to any other course in chemistry
CO 3	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
CO 4	Students will able to design and synthesize new complexes
CO 5	Students will able to carry out their research in future
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	1	PO 1	2
		PO 2	1
CO 2	4	PO 3	5
		PO 4	5
CO 3	2	PO 5	4
		PO 6	6
CO 4	6	PO 7	2
		PO 8	4
CO 5	3	PO 9	1
		PO 10	3
PSOs	KLs	PO 11	3
		PO 12	2
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	3

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	Programme Outcome (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO2	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO3	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO4	1	1	2	2	1	3	1	1	1	1	1	1	1	3	1
CO5	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)					
Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	1	2	2	1	3
PSO2	1	3	1	1	2
PSO3	3	1	2	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Organic Estimations and Spectral Interpretations**	Periods	35
	Iron and Magnesium, Iron and Nickel, Copper and Nickel, Copper and Zinc		
Unit - II	**Preparations**	Periods	40
	Tris(thiourea)copper(I) chlorideBis(acetylacetanato) copper(II) Hexamminecobalt(III) chlorideSodium hexanitrocobaltate(III) Potasium trioxalatoaluminate(III) trihydrate Chloropentamminecobalt(III) chlorideHexamminenickel(II) chloride		
Total Periods			75

Text Books	
References	
1	J. Mendham, R.C. Denney, J.D. Barnes, M.J.K. Thomas, Vogelâ€™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)
E-References	
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

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**4**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P4CHCP06	CORE PRACTICAL II: Physical Chemistry Practical - II				4	04	40	60	100
Course Objectives	To apply the principles of phase rule, adsorption in the analysis of physical and chemical properties of the given compounds and develop laboratory skills and the ability to work with instruments independently.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
PO 3	Capability to apply analytic thought to a body of knowledge analyse and evaluate evidence arguments claims beliefs on the basis of empirical evidence identify relevant assumptions or implications							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non familiar problems rather than replicate curriculum content knowledge and apply ones learning to real life situations							
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PO 6	A sense of inquiry and capability for asking relevant appropriate questions problematising synthesising and articulating ability to recognise cause and effect relationships define problems formulate hypotheses.							
PO 7	Ability to work effectively and respectfully with diverse teams facilitate cooperative or coordinated effort on the part of a group and act together as a group in the interests of work efficiently as a member of a team.							
PO 8	Ability to analyse interpret and draw conclusions from quantitative qualitative data and critically evaluate ideas, evidence and experiences from an open minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations demonstrate ability to access evaluate and use a variety of relevant information sources and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.							
PO 13	Ability to embrace moral ethical values in conducting one's life formulate a position argument about an ethical issue from multiple perspectives and use ethical practices in all work.							
PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

COs	COURSE OUTCOME
CO 1	Students will understand the breadth and concepts of physical chemistry.
CO 2	Students will develop skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
CO 3	Students will plan, conduct, review and report the experiment.
CO 4	Students will analyze the possible errors in phase studies.
CO 5	Students will evaluate the adsorption mechanism with time.
Pre-requisites	

KNOWLEDGE LEVELS

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	KLs	POs	KLs
CO 1	2	PO 1	3
		PO 2	1
CO 2	1	PO 3	4
		PO 4	2
CO 3	3	PO 5	6
		PO 6	6
CO 4	2	PO 7	2
		PO 8	1
CO 5	6	PO 9	1
		PO 10	4
PSOs	KLs	PO 11	5
		PO 12	3
PSO 1	3	PO 13	1
PSO 2	4	PO 14	6
PSO 3	1	PO 15	1

CO / PO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	**Programme Outcome (POs)**														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2	2	1	3	1	1	1	2	2	1	1	2	2	1	2
CO2	1	3	1	2	1	1	2	3	3	1	1	1	3	1	3
CO3	3	1	2	2	1	1	2	1	1	2	1	3	1	1	1
CO4	2	2	1	3	1	1	1	2	2	1	1	2	2	1	2
CO5	1	1	1	1	3	3	1	1	1	1	2	1	1	3	1

CO / PSO Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

Cos	Programme Specific Outcome (POs)				
	CO1	CO2	CO3	CO4	CO5
PSO1	2	2	3	2	1
PSO2	1	1	2	3	2
PSO3	2	2	1	1	1

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	**Non- Electrical Experiments**	Periods	75
	i. Phase rule studies a) Two component systems-Simple Eutectic formation b) Phase diagram of a two-component system forming compound (with congruent melting point). c) Phase diagram of a three component liquid system (with one partially miscible pair) (Toluene-Water- Acetic acid). ii. Heat of solution of benzoic acid in water. iii. Verification of Freundlich adsorption isotherm (Adsorption of oxalic acid on Charcoal). iv. Comparison of strengths of three acids from kinetic study (Iodination of acetone). v. Determination of E_a and A (for the hydrolysis of ethyl acetate at different temperatures). vi. Estimation of KI by partition method.		
Total Periods			75

Text Books and References	
1	A .O. Thomas, Practical Chemistry, Scientific Book Centre, Cannanore (2003).
2	V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).
1	B Viswanathan, P.S. Raghavan, Practical Physical Chemistry, Viva Books Private Limited, (2005).
E-References	
1	http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Material Science
2	http://www.cffet.net/sia-e/2_Pot_titr.pdf

Signature of BOS Chairman

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	**M.Sc**	Programme Code	**PCH**			Regulations	**2020-2022**	
Department	**Chemistry**		Semester				**4**	
Course Code	Course Name		Periods per Week			Credit	Maximum Marks	
			L	T	P	C	CA	ESE	Total
20P4PR01	PROJECT			5		04	40	60	100
Course Objectives	1. To inculcate the habit of literature survey among the students. 2. To offer skill based knowledge to the students. 3. To facilitate the students towards basic research and development.							
POs	**PROGRAMME OUTCOME**							
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.							
PO 2	Ability to express thoughts and ideas effectively in writing and orally Communicate with others using appropriate media confidently share ones views and express herself /himself.							
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PO 14	Capability for mapping out the tasks of a team or an organization and setting direction formulating an inspiring vision building a team who can help achieve the vision motivating.							
PO 15	Ability to acquire knowledge and skills including learning how to learn that are necessary for participating in learning activities throughout life through self paced.							

Signature of BOS Chairman

QP CODE-20P3CHC06

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

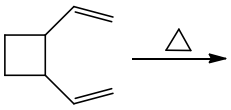
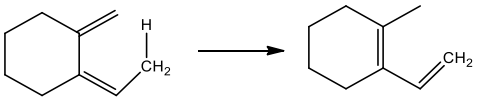
MODEL QUESTION PAPER

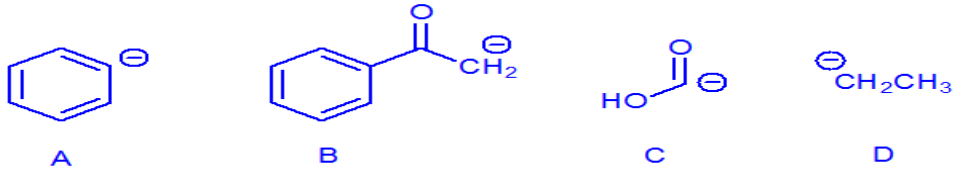
Programme(s)	Title of the Paper	Semester
M.Sc. CHEMISTRY	Natural Products, Pericyclic reactions and Retro synthesis	III

Time: 3 Hrs. Max.Marks : 75

Section A
Answer all questions (20 x 1 = 20)

1	Zingiberene is example for				K1	CO-1
	A	Mono terpenes	B	Sesqui terpenes		
	C	Di terpenes	D	Tri terpenes		
2	Which one of the following is an example of bicyclic mono terpenes?				K2	CO-1
	A	α-Pinene	B	Meroquinine		
	C	Citral	C	None of these		
3	Which of the following is animal sterol Cholesterol is ------- compound				K2	CO-1
	A	Mycosterol	B	Stigmasterol		
	C	Cholesterol	D	None of these		
4	How many angular methyl group present in oestrone?				K2	CO-1
	A	2	B	3		
	C	1	D	4		
5	Quinine on oxidation with chromic acid gives quininic acid and				K2	CO-2
	A	Lutidine	B	Conine		
	C	Formic acid	D	Papaverine		
6	Which of the following alkaloid having Isoquinoline group?				K1	CO-2
	A	Quinine	B	Conine		
	C	Nicotine	D	Papaverine		
7	Dihydro flavone is otherwise called_____				K1	CO-2

	A	Flavanoid	B	Isoflavone		
	C	Flavanone	D	Chalcone		
8	Flavonoids is a powerful_____				K1	CO-2
	A	Antioxidant agent	B	Antibiotic agent		
	C	Chromones	D	Flavones		
9	The fundamental nucleus in anthocyanines is _____				K1	CO-3
	A	Fluoroglucinol	B	Benzopyrylium chloride		
	C	Phenolic acid	D	None of the above		
10	Which one of the following is purine bases?				K2	CO-3
	A	Adenine and Thymine	B	Thymine and Cytosine		
	C	Cytosine and Guanine	D	Adenine and Guanine		
11	Which of the following vitamins is also known as cobalamin?				K1	CO-3
	A	Vitamin B_4	B	Vitamin B_2		
	C	Vitamin B_6	D	Vitamin B_{12}		
12	Which of the following is essential for the development of red blood cell?				K1	CO-3
	A	Vitamin A	B	Vitamin C		
	C	Vitamin B_{12}	D	Vitamin D		
13	The electrocyclic reaction for ground state of haxatrienes ----- rotatory				K3	CO-4
	A	Con	B	Dis		
	C	Con or Dis	D	Cannot be predicted		
14	The product of following reaction is 				K1	CO-4
	A		B			
	C		D			
15	In a cyclo addition reaction, if both the bonds to a component are formed on the same face, the process is termed as				K3	CO-4
	A	Suprafacial	B	Antarafacial		
	C	Supra-suprafacial	D	Antara-antarafacial		
16	 The above sigmatropic reaction is example of				K2	CO-4

	A	[1,4]	B	[1,4]		
	C	[1,5]	D	[1,5]		
17	The following species is best known as $^{-}$CHO				K1	CO-5
	A	a1 species	B	d1 umpolung		
	C	d2 species	D	a2 species		
18	Which of the following statements best describes a synthon?				K1	CO-5
	A	A synthetic reagent used in a reaction	B	A key intermediate in a reaction sequence		
	C	A transition state involved in a reaction mechanism	D	A hypothetical structure that would result in a given reaction if it existed		
19	Which of the following synthons is an example of Umpulong ?  A B C D				K1	CO-5
	A	Structure A	B	Structure B		
	C	Structure C	D	Structure D		
20	Which of the following statements best describes a disconnection in retrosynthesis?				K3	CO-5
	A	A disconnection involves a theoretical disconnection of a bond in a target structure in order to identify simpler structures that could be linked through the formation of that bond	B	A disconnection involves identifying stages where a bond is split in the corresponding synthesis		
	C	A disconnection identifies retrosynthetic stages which would not be feasible in the corresponding synthesis	D	A disconnection describes the reaction conditions required to split a target structure into simpler molecules.		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Describe the following synthesis, 1) Papaverine 2) Zingiberene			K2	CO-1
		OR				
	B	Explain the structural elucidation of α - pinene.			K1	CO-1
22	A	What are alkaloids? Explain its classification in brief.			K2	CO-2
		OR				

	B	Explain about the Kostaneck synthesis of flavones	K3	CO-2
23	A	Describe the synthesis of anthocyanin in detail.	K3	CO-3
		OR		
	B	Describe the structural elucidation of vitamin B12 in brief.	K1	CO-3
24	A	Write a detailed note on cycloaddition	K2	CO-4
		OR		
	B	Explain the Claisen rearrangement with mechanism	K2	CO-4
25	A	Explain synthons with their synthetic equivalent.	K1	CO-5
		OR		
	B	Describe disconnection approach.	K2	CO-5
Section C Answer ANY THREE Questions (3 x 10 = 30)				
26		Explain the structural elucidation of cholesterol.	K4	CO-1
27		What are alkaloids? Describe the structural elucidation of morphine in detail.	K3	CO-2
28		Explain the structure and biological applications of anthocyanins in detail	K3	CO-3
29		Explain the FMO method for analyzing an electrocyclic reactions with an example.	K3	CO-4
30		Explain umpolung in carbonyls and amino functional group	K4	CO-5

QP CODE-20P3CHC07

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	**Title of the Paper**	**Semester**
M.Sc. CHEMISTRY	Organometallic, Solid state, Spectroscopy and Bio-inorganic Chemistry	III

Time: 3 Hrs. Max.Marks : 75

Section A

Answer all questions (20 x 1 = 20)

1	The complete combustion of diborane is _____				K1	CO-1
	A	endothermi	B	exothermic		
	C	there is no change in energy	D	Depends on the reaction		
2	Which of the following compound exists in liquid state?				K2	CO-1
	A	Diborane	B	Pentaborane		
	C	Decaborane	C	Borane		
3	7(i)+ $B(OCH_3)_3$ → $NaBH_4$ + 6(ii)+ 3(iii) Name the compounds i, ii, iii?				K2	CO-1
	A	i.sodium hydride ii.sodium iii.methanol	B	i.sodium ii.methanol iii.sodium hydride		
	C	i.sodium ii.sodium hydride iii.methanol	D	i.sodium hydride ii.methanol iii.sodium		
4	Which of the following is not used as raw material for production of boranes?				K2	CO-1
	A	Methanol	B	Sodium borohydride		
	C	Glycol ether	D	Mineral oil		
5	Which of the following is the neutral complex which follows the 18- electron rule?				K2	CO-2
	A	$(\eta^5\text{-}C_5H_5)Fe(CO)_2$	B	$(\eta^5\text{-}C_5H_5)2Mo(CO)_3$		
	C	$(\eta^5\text{-}C_5H_5)_2Co$	D	$(\eta^5\text{-}C_5H_5)2Re(\eta^6\text{-}C_6H_6)$		
6	How many M — M bonds are present in $[Cp\ Mo(CO_3)]_2$?				K1	CO-2
	A	1	B	2		
	C	0	D	4		

7	Which of the following complex has a highest oxidation state of metal?				K1	CO-2
	A	$(\eta^6\text{-}C_6H_6)_2Cr$	B	$Mn(CO)_5Cl$		
	C	$Na_2[Fe(CO)_4]$	D	$K[Mn(C_5]$		
8	Which of following pair is not isolobal?				K1	CO-2
	A	$Mn(CO)_5$, CH_3	B	$[Fe(CO)_4]$, O		
	C	$Mn(CO)_5$, Cl	D	$Mn(CO)_5$, O		
9	The smallest repetitive unit of the crystal structure is known as				K1	CO-3
	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_____				K2	CO-3
	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				K1	CO-3
	A	000	B	001		
	C	011	D	111		
12	Example for dia-magnetic materials				K1	CO-3
	A	super conductors	B	Alkali metals		
	C	Transition metals	D	Ferrites		
13	Which of the following is the principle of Atomic Absorption Spectroscopy?				K3	CO-4
	A	Radiationisabsorbedbynon-excitedatomsinvapourstateandareexcitedtohigher 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?				K1	CO-4
	A	Tungsten lamp	B	Xenon mercury arc lamp		
	C	Hydrogen or deuterium discharge lamp	D	Hollow cathode lamp		

15	ESCA gives sufficient chemical information upto a depth about_armstrong in metals.				K3	CO-4
	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?				K2	CO-4
	A	Environmental disturbances	B	Same mass		
	C	Same charge	D	the electron- electron interaction		
17	Oxidation state of Iron in haemoglobin is				K1	CO-5
	A	+1	B	+2		
	C	+3	D	None		
18	The ligand system present in vitamin B_{12}				K1	CO-5
	A	porphyrin	B	Corrin		
	C	Phthalocyanin	D	crown ether		
19	Central metal atom/ion in chlorophyll is				K1	CO-5
	A	Iron	B	Manganese		
	C	Magnesium	D	Zinc		
20	What are the complications that occur in severe thalassemia disease?				K3	CO-5
	A	Bone deformities	B	Enlarged spleen		
	C	Heart problems	D	All of the above		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Explain the ring compounds of sulphur and nitrogen			K2	CO-1
		OR				
	B	Distinguish between isopolyanions - heteropolyanions			K1	CO-1
22	A	Describe the synthesis and structure of metallocene.			K2	CO-2
		OR				
	B	Express your ideas about chain carbon donar and cyclic carbon donar.			K3	CO-2
23	A	Write notes on space groups and miller indices.			K3	CO-3
		OR				

	B	Explain magnetic properties of solids.	K1	CO-3
24	A	Describe about principle of AAS.	K2	CO-4
		OR		
	B	Write notes on Koopman's theorem and chemical shift.	K2	CO-4
25	A	Explain the structure and work function of haemoglobin.	K1	CO-5
		OR		
	B	Describe about chelate therapy.	K2	CO-5
Section C **Answer ANY THREE Questions (3 x 10 = 30)**				
26		Explain in detail about metal clusters and its types	K4	CO-1
27		Write the hydroformylation of olefins using Cobalt or Rhodium catalysts	K3	CO-2
28		Explain defects in solids.	K3	CO-3
29		Discuss theory and applications of PES.	K3	CO-4
30		Explain the structure and work functions of Chlorophyll.	K4	CO-5

QP CODE: 20P3CH08

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc., Chemistry	Quantum Chemistry and Thermodynamics	III

Time: 3 Hrs. Max. Marks : 75

Section A

Answer all questions (20 x 1 = 20)

1	Out of these which one is angular variables				K1	CO-1
	A	φ, θ	B	θ, r		
	C	φ, r	D	r, R		
2	$\int\psi\psi^*d\tau = 1$, eigen functions are				K1	CO-1
	A	real	B	normalized		
	C	orthogonal	D	continuous		
3	If a particle is in 1D box and n=3, the E is				K1	CO-1
	A	$h^2/8Ma^2$	B	$12h^2/8Ma^2$		
	C	$9h^2/8Ma^2$	D	$4h^2/8Ma^2$		
4	$Y_{lm}(\theta,\varphi)$ are called				K1	CO-1
	A	quantum number	B	wave function		
	C	reduced mass	D	spherical harmonics		
5	$\bar{E}$-E_0 is always				K1	CO-2
	A	positive	B	zero		
	C	negative	D	constant		
6	The integral S_{ab} is called				K1	CO-2
	A	coulomb integral	B	overlap integral		
	C	resonance integral	D	secular integral		
7	The energy level E_4 of benzene molecule is				K1	CO-2
	A	2α-β	B	α-2β		
	C	α-β	D	α+β		
8	$\hat{F}$ denotes				K1	CO-2
	A	linear operator	B	angular operator		

	C	Hermitian operator	D	Fock operator		
9	Fugacity was introduced by				K1	CO-3
	A	Duhem	B	Morgan		
	C	Lewis	D	Gibbs		
10	Gibbs Helmholtz equation of 'T' is				K1	CO-3
	A	$\bar{H}/T^2$	B	$-\bar{H}/T^2$		
	C	$\bar{H}/T$	D	$-\bar{H}/T$		
11	The quantity H_o-H represents				K1	CO-3
	A	ideal heat of formation	B	ideal heat of fusion		
	C	ideal heat of vaporization	D	ideal heat of evaporation		
12	C_p in Kirchhoff's law represents				K1	CO-3
	A	current potential	B	constant		
	C	energy	D	heat capacity		
13	The equation for the evaluation of β in M.B. distribution law is				K1	CO-4
	A	$\beta = 1/kT$	B	$\beta = -1/kT$		
	C	$\beta = kT$	D	$\beta = 2/kT$		
14	The vibrational energy levels of a diatomic are given by				K1	CO-4
	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		
15	What is the rotational partition function of H_2 at 300 K?				K1	CO-4
	A	1.923	B	1.723		
	C	1.823	D	1.623		
16	A partition function can be used to calculate				K1	CO-4
	A	Free energy	B	Enthalpies		
	C	Entropies	D	none of these		
17	The essential contribution to the thermodynamics of the non-equilibrium systems was brought by				K1	CO-5
	A	Fermi	B	Einstein		
	C	Pokrovskii	D	Prigogine		

18	Non-equilibrium thermodynamics is concerned with transport processes and				K1	CO-5
	A	energy of chemical reactions	B	rates of chemical reactions		
	C	frequency	D	state variables		
19	The thermodynamic study of non-equilibrium steady states, in which entropy production and some flows are				K1	CO-5
	A	Zero	B	Non-zero		
	C	one	D	none of these		
20	The entropy (S) is a function of the collection of				K1	CO-5
	A	Intensive variable	B	Massieu potential		
	C	extensive quantities	D	extended Massieu function		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Explain the postulates of quantum mechanics.			K2	CO-1
		OR				
	B	Illustrate eigen value and eigen function.			K2	CO-1
22	A	Write a note on self consistent field approximation.			K2	CO-2
		OR				
	B	Give the application of VB theory to hydrogen molecule.			K2	CO-2
23	A	Find out the fugacity of a real gas by graphical method.			K2	CO-3
		OR				
	B	Illustrate Gibbs Duhem equation.			K2	CO-3
24	A	Write a brief note on vibrational partition function.			K2	CO-1
		OR				
	B	Discuss about distribution of distinguishable and non distinguishable particles.			K2	CO-1
25	A	Justify the entropy production in heat flow and matter flow.			K2	CO-2
		OR				
	B	Describe in detailed about non-equilibrium stationary states.			K2	CO-2
	Section C **Answer ANY THREE Questions (3 x 10 = 30)**					
26		Prove and derive a S.E. for application of perturbation method to H atom.			K3	CO-1
27		Explain HMO theory to ethylene system.			K4	CO-2
28		Determine the fugacity of a real gas by equation of state.			K5	CO-3
29		Derive and explain Fermi-Dirac statistics law.			K3	CO-1
30		Verify Onsager reciprocal relation using electro kinetic phenomenon.			K4	CO-2

QP CODE-20P4CH09

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	Physical methods in Chemistry	IV

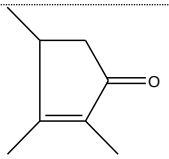
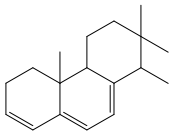
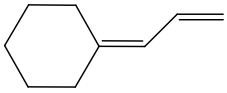
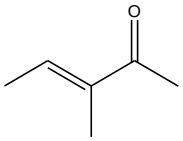
Time: 3 Hrs. Max.Marks : 75

Section A
Answer all questions (20 x 1 = 20)

1	Pick out the microwave inactive molecule				K1	CO-1
	A	CO_2	B	CO		
	C	KCl	D	NO		
2	Radio frequency deals with which spectroscopy				K1	CO-1
	A	rotational	B	NMR		
	C	vibrational	D	electronic		
3	$I_B=I_C\neq I_A$ refers				K1	CO-1
	A	linear molecules	B	spherical tops		
	C	symmetric tops	D	asymmetric tops		
4	The quantity "J" stands for				K1	CO-1
	A	vibrational quantum number	B	magnetic quantum number		
	C	electronic quantum number	D	rotational quantum number		
5	The bond length for non-cyclic triatomic molecule is				K1	CO-2
	A	2	B	3		
	C	4	D	1		
6	The energy curve of HCl is				K1	CO-2
	A	compound	B	parabola		
	C	spiral	D	simple		
7	In Raman spectra, symmetric top molecules have $\Delta J=+1$ indicates				K1	CO-2
	A	Q branch lines	B	S branch lines		

	C	R branch lines	D	P branch lines		
8	$\varepsilon_J = BJ(J+1) - DJ^2(J+1)^2$, here D denotes				K1	CO-2
	A	distortion constant	B	Boltzmann's constant		
	C	rotational constant	D	centrifugal distortion constant		
9	UV spectroscopy is useful for the detection of				K1	CO-3
	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				K1	CO-3
	A	186	B	176		
	C	156	D	136		
11	An auxochrome is one which is				K1	CO-3
	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				K1	CO-3
	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				K1	CO-4
	A	radio frequency	B	microwave		
	C	UV/Vis	D	X-ray		
14	Which of the following solvents cannot be used in NMR spectroscopy?				K1	CO-4
	A	CCl_4	B	CS_2		
	C	$CHCl_3$	D	$(CCl_3)_2C=O$		
15	Vicinal F-F coupling ranges from ……. cps				K1	CO-4
	A	43-370	B	0-58		
	C	0-39	D	42-80		
16	ESR is used to control the state of electron spin quits in				K1	CO-4
	A	diamond	B	gallium		
	C	silicon	D	all the above		
17	The molecular ion peak is usually intense for				K1	CO-5
	A	aromatic compounds	B	conjugated olefins		
	C	alcohols	D	neoalkanes		
18	In case of polynuclear hydrocarbons, the base peak appears				K1	CO-5

	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 usually the base peak for				K1	CO-5
	A	aldehydes	B	ketones		
	C	acids	D	all of these		
20	Mossbauer Spectroscopy associates with …… rays				K1	CO-5
	A	radio	B	gamma		
	C	X-ray	D	Cosmic		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Write a brief note on vibrational partition function.			K2	CO-1
		OR				
	B	Discuss about distribution of distinguishable and non distinguishable particles.			K2	CO-1
22	A	Justify the entropy production in heat flow and matter flow.			K2	CO-2
		OR				
	B	Describe in detailed about non-equilibrium stationary states.			K2	CO-2
23	A	List out and explain bands in UV-Vis spectrum.			K2	CO-3
		OR				
	B	Explain the principles and applications of fluorescence spectroscopy.			K2	CO-3
24	A	Write a detailed note on absorption and emission spectrum.			K2	CO-4
		OR				
	B	Describe rotational, vibrational and electronic spectra.			K2	CO-4
25	A	Draw and explain the energy of diatomic molecule.			K2	CO-5
		OR				
	B	Explain the rotational Raman spectra of symmetric top molecules.			K2	CO-5
	Section C **Answer ANY THREE Questions (3 x 10 = 30)**					
26		Draw and derive the energy equation for rigid linear diatomic molecules.			K3	CO-1
27		Justify the pure rotational Raman spectra of linear molecules.			K4	CO-2
28		Calculate λ_{max} for the following compounds. (i) (ii)			K5	CO-3

		  (iii) (iv)  		
29		Define chemical shift. What are the factors affecting chemical shift?	K4	CO-4
30		Draw and explain the components of mass spectrophotometer.	K3	CO-5

QP CODE-20P4CHE05

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

PG & RESEARCH DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	Environmental Chemistry	IV

Time: 3 Hrs. Max.Marks : 75

Section A

Answer all questions (20 x 1 = 20)

1	Which of the following is produced when electrical discharges pass through oxygen in air?				K1	CO-1
	A	Ozone	B	Methane		
	C	CFCs	D	Lead compounds		
2	Temperature of outer mesosphere is				K1	CO-1
	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				K1	CO-1
	A	Minamata disease	B	Brights disease		
	C	Hashimotos disease	D	Osteosclerosis		
4	Which of the following play significant role in depletion of ozone layer?				K2	CO-1
	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 _____				K1	CO-2
	A	2-4ppm	B	4-7ppm		
	C	4-6ppm	D	2-7ppm		
6	By aerobic process _____ of biodegradable water is converted into the biomass.				K1	CO-2
	A	10%	B	30%		
	C	50%	D	75%		
7	Reacting the water with _____ removes the odour due to the phenols.				K2	CO-2
	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				K1	CO-2
	A	Initial demand	B	First stage demand		
	C	Carbonaceous demand	D	All of these		
9	Plastics enter the marine environment primarily by				K2	CO-3
	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?				K2	CO-3
	A	Mold	B	Radon		
	C	Asbestos	D	Formaldehyde		
11	Polychlorinated biphenyls (PCBs), affecting				K1	CO-3
	A	Estrogen metabolism	B	Blood Circulation		
	C	Cell membrane	D	Biodegradable		
12	Polychlorinated biphenyls' are by products of plastics, lubricants, rubber and				K2	CO-3
	A	Paper production	B	Wood production		
	C	Steel production	D	All of above		
13	What is impact of overuse of inorganic fertilizers?				K1	CO-4
	A	High level of nitrates & Eutrophications	B	Salinization		
	C	Desalinization	D	Increase soil Fertility		
14	Costly and harmful pesticides can be replaced by				K1	CO-4
	A	Artificial Predators	B	Natural Predators		
	C	Small Animals	D	Weeds		
15	What are impacts of over cultivation & over grazing?				K2	CO-4
	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				K2	CO-4
	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 ___				K1	CO-5
	A	landfill	B	river		
	C	ocean	D	any of the above		

18	Which of the below is not an idea behind solid waste management?				K2	CO-5
	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?				K1	CO-5
	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?				K2	CO-5
	A	Ethane	B	Methane		
	C	Propene	D	Ethene		
	Section B **Answer All questions (5x 5 = 25)**					
21	A	Explain the terms of chemical potential and chemical equilibria in environmental Concept.			K2	CO-1
		OR				
	B	Write short notes on fundamentals of environmental chemistry			K2	CO-1
22	A	Discuss the detrimental effects of inorganic pollutants in water.			K3	CO-2
		OR				
	B	Explain redox potential in water chemistry.			K3	CO-2
23	A	Write a short note on Polychlorinated Biphenyls.			K2	CO-3
		OR				
	B	Write a note on sources of asbestos in the environment.			K2	CO-3
24	A	Write the short notes on Environmental Implications of Fungicides and Herbicides.			K3	CO-4
		OR				
	B	Explain the Environmental implications of Insecticides.			K3	CO-4
25	A	Write notes on Municipal waste into road making.			K4	CO-5
		OR				
	B	Explain about Waste management.			K4	CO-5
	Section C **Answer ANY THREE Questions (3 x 10 = 30)**					
26		Explain the sample techniques for air, water and soil in Environmental chemistry.			K4	CO-1
27		What are COD and BOD? Explain with suitable method to calculate.			K4	CO-2
28		Explain the Environmental Implications of Polymers and Plastics.			K2	CO-3

29		Explain the Abatement procedures for fungicides and Herbicides pollution.	K4	CO-4
30		Write the notes on the following (i) Utilizing agricultural waste (ii) Wealth from waste.	K4	CO-5

QP CODE-20P4CHE06

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

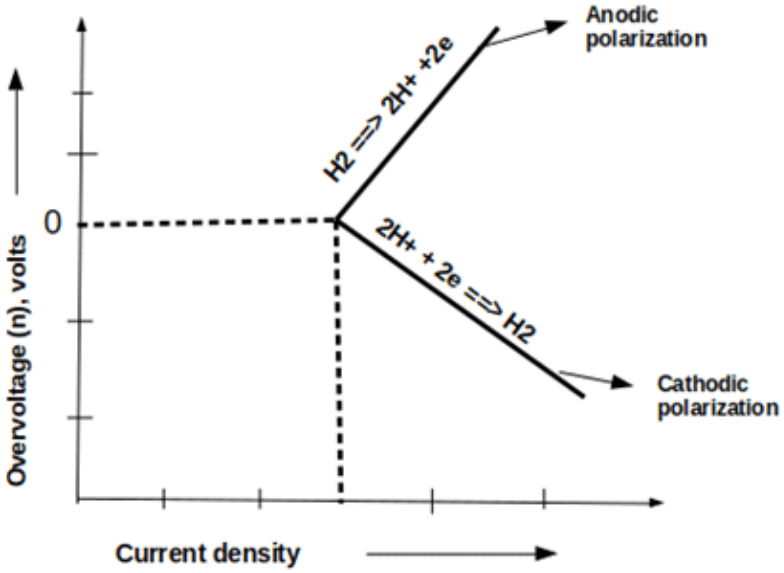
MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. CHEMISTRY	Corrosion Principles, Protection and Monitoring	IV

Time: 3 Hrs. Max.Marks : 75

Section A
Answer all questions (20 x 1 = 20)

1	What is mechanism of dry corrosion				K1	CO-1
	A	Absorption	B	Electrochemical theory		
	C	Differential solubility	D	B & C		
2	Which of the following factors affect the corrosion rate of the metal?				K2	CO-1
	A	Relative surface area of an cathode and anode	B	Nature of the metal oxide layer		
	C	Purity of metal	C	All of these		
3	The cathodic reaction that occurs during corrosion in oxygenated acidic solution is				K2	CO-1
	A	$2H^+ + 2e \rightarrow H_2$	B	$4H^+ + 4e - O_2 \rightarrow 4OH^-$		
	C	$2H_2O + 2e \rightarrow 2H_2 + 2OH^-$	D	$2H_2O + 2e \rightarrow 2OH^-$		
4	Which theory explains the oxidation of metals?				K2	CO-1
	A	Collision theory	B	Molecular orbital theory		
	C	Wagner theory	D	Mixed potential theory		
5	Which of the following materials will undergo corrosion				K2	CO-2
	A	Metals	B	Metals and non metals		
	C	Ceramics and plastics	D	All of the above		
6	Which of the following subjects are important in controlling the corrosion?				K1	CO-2
	A	Thermodynamics	B	Electrochemistry		
	C	Both	D	Materials characterization		

7	What type of protection is galvanizing ?				K1	CO-2
	A	Physical protection	B	Sacrificial protection		
	C	Both of the above	D	None of the above		
8	The following factors will play vital role in corrosion processes				K1	CO-2
	A	Temperature	B	Solute concentration		
	C	Both	D	None		
9	Which of the following is correct regarding polarization ?				K1	CO-3
	A	It is the deviation from equilibrium potential	B	It results from the change in net current flow		
	C	Magnitude in terms of over voltage	D	It is the deviation from equilibrium potential that occurred due to change in current flow and its magnitude is measured in terms of overvoltage		
10	What is depicted in the given figure? 				K2	CO-3
	A	Concentration polarization of hydrogen-hydrogen io	B	Resistance polarization of hydrogen-hydrogen io		
	C	Activation polarization of hydrogen-hydrogen ion	D	Both activation and concentration polarization of hydrogen-hydrogen io		
11	Which of the following is the controlling factor of Activation polarization?				K1	CO-3
	A	The activation energy of a reaction	B	Diffusion of ions in the solution		

	C	The temperature of a solution	D	The velocity of a solution		
12	What is the formula to calculate rate of oxidation or rate of reduction during equilibrium?				K1	CO-3
	A	$r_0=r_R=i0nF$	B	$r_0=r_R=i_0/nF$		
	C	$r_0=r_R=i_0n/F$	D	$r_0=r_R=nF/io$		
13	--- is used for coating of low melting point metals such as Zn,Sn,Pb,Al on Fe,steel and Cu				K3	CO-4
	A	Hot dipping	B	Anodic coating		
	C	Cathodic coating	D	Galvanizing		
14	--- is the process of coating of Fe or steel with Zinc is called				K1	CO-4
	A	Tinning	B	Hot dipping		
	C	Galvanizing	D	None of these		
15	---- Coating is non toxic in nature				K3	CO-4
	A	Sn	B	Zn		
	C	Fe	D	Cu		
16	Corrosion can be prevented by				K2	CO-4
	A	Applying coating that acts as a barrier	B	Materials react		
	C	Forms an oxide layer	D	None of these		
17	The oxide coating around aluminum				K1	CO-5
	A	Protects the metal from further corrosion	B	Iron only will rust		
	C	More reactive metal than iron	D	Iron will not rust		
18	In galvanizingironthe Zinc reacts instead ofiron and therefore be				K1	CO-5
	A	Iron will not rust	B	Protect the metal from further corrosion		
	C	Corrosion can be prevented	D	Corroded		
19	--- are used as corrosion inhibitors of iron and steel in aqueous solution s				K1	CO-5
	A	Phosphates	B	Chromates		
	C	Sulphates	D	Bi carbonates		
20	Identify the group which is not used as anodic inhibitor				K3	CO-5
	A	Chromates	B	phosphates		
	C	Sulphates	D	Tungstates		
	Section B **Answer All questions (5 x 5 = 25)**					

21	A	Define corrosion. What are the consequences of corrosion ?	K2	CO-1
		OR		
	B	What are the differences between chemical (dry corrosion) and electrochemical (wet corrosion)	K1	CO-1
22	A	Explain the Thermodynamics theory of corrosion.	K2	CO-2
		OR		
	B	What is meant by polarization ?how it can be measured ?	K3	CO-2
23	A	Explain corrosion weight loss method in detail.	K3	CO-3
		OR		
	B	What is electrochemical impedance spectroscopy.	K1	CO-3
24	A	Discuss the various factors influencing rate of corrosion and their prevention methods.	K2	CO-4
		OR		
	B	Explain the following 1. Hot dipping 2.Metal cladding	K2	CO-4
25	A	What is vapour phase inhibitors? Give examples.	K1	CO-5
		OR		
	B	Explain the inhibition of reinforcement of concrete steel in water environment.	K2	CO-5
Section C Answer ANY THREE Questions (3 x 10 = 30)				
26		What do you mean electrochemical corrosion? Explain the cathodic and anodic corrosion mechanism.	K4	CO-1
27		Explain Pourbaix diagram of water, iron and aluminium in detail. What are its limitations?	K3	CO-2
28		Discuss briefly about potentio dynamic and galvano dynamic polarization techniques.	K3	CO-3
29		What do you mean by cathodic protection? Discuss the sacrificial anodic protection and impressed current cathodic protection methods.	K3	CO-4
30		What are corrosion inhibitors? Explain anodic and cathodic inhibitors in details.	K4	CO-5

QP CODE-20P3CHED01

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. PHYSICS	Elective paper: Applied Polymer Chemistry	III

Time: 3 Hrs. Max.Marks :75

Section A

Answer all questions (10 x 1 = 10)

1	Polyethylene is a example for…….				K1	CO-1
	A	monomer	B	High polymer		
	C	polymer	D	none		
2	The degree of polymerization of 5 CH_2=CH_2 is				K1	CO-1
	A	2	B	3		
	C	4	D	5		
3	The linear polymer have ……..melting points				K1	CO-1
	A	low	B	high		
	C	medium	D	none		
4	In free radical mechanism initiation hemolytic dissociation to yield a ……of free radical				K3	CO-1
	A	Pair	B	non-pair		
	C	three	D	none		
5	In Zieglar Natta polymerization a vanadium catalyst gives a …..product				K2	CO-2
	A	isotactic	B	syndiotactic		
	C	eutectic	D	none		
6	R-Ticl4 compound used in ……..coordination				K2	CO-2
	A	mono	B	bimetallic		
	C	Both a and b	D	none		
7	The following one is the example for copolymerisation				K3	CO-2
	A	PVC	B	PE		

	C	SBR	D	none		
8	-A-A-A-A-B-B-B-B-A-A-A is the example for……				K2	CO-2
	A	block	B	graft		
	C	copolymerisation	D	none		
9	Reactivity ratio only depends on the				K2	CO-3
	A	T,P	B	T,C		
	C	P,C	D	none		
10	The dispersity is a measure of heterogeneity of ……..of particles in a mixture				K2	CO-3
	A	size	B	length		
	C	weight	D	none		
11	In weight average method W1=				K2	CO-3
	A	n1M1	B	N1N2		
	C	M1M2	D	none		
12	In light scattering method ……is used as a source				K4	CO-3
	A	Mercury arc	B	laser		
	C	a and b	D	none		
13	The calendaring machine is a set of highly polished …….rollers				K1	CO-4
	A	steel	B	metal		
	C	solid	D	aluminium		
14	In rotational casting gelation takes place at ……◦C				K1	CO-4
	A	100-150	B	150-200		
	C	200-250	D	300		
15	In injection moulding the molten plastic material is injected under…….Kg/Cm^2				K2	CO-4
	A	1300	B	1400		
	C	1500	D	1600		
16	Blow moulding is basically used in …….industry				K2	CO-4
	A	rubber	B	Plastic		
	C	glass	D	steel		
17	In PVC preparation following one is used as a catalyst				K2	CO-5
	A	mercury chloride	B	metal chloride		
	C	Both a and b	D	none		
18	Polyester is prepared by the condensation of terephthalic acid and …….glycol				K1	CO-5

	A	methylene	B	ethylene		
	C	propylene	D	acetylene		
19	Silicone polymers are prepared by the hydrolysis of alkyl substituted ……silane				K2	CO-5
	A	chloro	B	Bromo		
	C	iodo	D	flouro		
20	The following one polymer is mainly used in contact lenses and dental restorations				K3	CO-5
	A	Polymethyl methacrylate	B	Polyethyl methacrylate		
	C	Both a and b	D	none		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Explain the mechanism of cationic polymerisation			K4	CO-1
		OR				
	B	Explain the following polymers a) linear b) branched c) network			K3	CO-1
22	A	Give an account of Ziegler Natta catalyst			K2	CO-2
		OR				
	B	Write short notes on cross linked polymers and their applications			K4	CO-2
23	A	How to determine the molecular weight by number average method			K1	CO-3
		OR				
	B	How will determine the molecular weight by viscosity method			K4	CO-3
24	A	Write notes on die casting method			K3	CO-4
		OR				
	B	Explain the rotational casting method			K2	CO-4
25	A	Explain the following a)polyamide b)polyester			K1	CO-5
		OR				
	B	Briefly explain the electrically conducting polymers			K1	CO-5
	Section C **Answer ANY THREE Questions (3 x 10 = 30)**					
26		Explain in detail about free radical mechanism			K3	CO-1
27		Briefly discuss the kinetics of copolymerisation			K1	CO-2
28		How the molecular weight of the polymer is measured by light scattering method			K3	CO-3
29		Explain the following a) Injection moulding b) Extrusion moulding			K1	CO-4
30		Write short notes on applications of bio medical polymers			K2	CO-5

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VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

MODEL QUESTION PAPER

Programme(s)	Title of the Paper	Semester
M.Sc. PHYSICS	Elective paper: Industrial Chemistry	III

Time: 3 Hrs. Max.Marks : 75

Section A

Answer all questions (20 x 1 = 20)

1	Which of the following is the correct pairing between the initial reactant and major product of a type of fermentation?				K1	CO-1
	A	Lactate; glucose	B	Acetate; ethylene glycol		
	C	Ethanol; lactate	D	Glucose; lactate		
2	What is the primary function of fermentation?				K1	CO-1
	A	Production of ethanol to be used as a fuel source	B	Regeneration of NAD+		
	C	Regeneration of NADH	C	Production of lactic acid to be used as a fuel source		
3	During lactic acid fermentation, what is the final electron acceptor?				K1	CO-1
	A	Oxygen	B	Ethanol		
	C	Carbon dioxide	D	Pyruvate		
4	The type of fermentation observed in yeasts is				K1	CO-1
	A	acrylic fermentation	B	lactic acid fermentation		
	C	pyruvic fermentation	D	alcoholic fermentation		
5	Correct melting point of the drug Aspirin is?				K3	CO-2
	A	124°C	B	321°C		
	C	140°C	D	26°C		
6	Which of the following fermentation processes is used in the production of penicillin?				K1	CO-2
	A	Aerobic fermentation followed by anaerobic fermentation	B	Anaerobic fermentation		
	C	(c) Aerobic fermentation	D	Anaerobic fermentation followed by aerobic fermentation		

7	Which of the following species is used for producing streptomycin?				K1	CO-2
	A	Vitamin A	B	Vitamin D		
	C	Vitamin E	D	Vitamin K		
8	Which of the following events occurs during the third phase of growth of Penicillium chrysogenum?				K1	CO-2
	A	Autolysis of the medium starts	B	Slight rise in pH due to liberation of ammonia		
	C	The concentration of antibiotic increases in the medium	D	All of the above		
9	Photosynthetic pigments absorb				K4	CO-3
	A	UV radiation	B	IR radiation		
	C	Visible radiation	D	Gama radiation		
10	Which one among the following is used as red pigment				K1	CO-3
	A	Titanium dioxide	B	Iron oxide		
	C	Zinc oxide	D	Carbon black		
11	Pigment incorporation				K4	CO-3
	A	Increases hardness of the film	B	Reduces gloss		
	C	Improve masking ability	D	All of the above		
12	Zinc oxide is a metal oxide. Which of the following term best describes the nature of zinc oxide:				K1	CO-3
	A	an acidic oxide	B	a neutral oxide		
	C	an amphoteric oxide	D	a basic oxide		
13	Adhesives were				K3	CO-4
	A	Can’t be used in the form of pressure sensitive tapes	B	Can’t join two dissimilar metals		
	C	Cure instantaneously after application on a surface	D	None of these		
14	Enamel can act in a sense like a				K4	CO-4
	A	A. Permeable membrane	B	Impermeable membrane		
	C	Semipermeable membrane	D	Infrapermeable membrane		
15	A fifty percent straight dynamite contains				K4	CO-4
	A	5 percent of nitroglycerin	B	5 percent of trinitrotoluene (TNT)		
	C	50 percent of trinitrotoluene (TNT)	D	50 percent of nitroglycerin		
16	In recent years, dynamite has been replaced commercially by				K3	CO-4
	A	PETN	B	Nitroglycerin		

	C	TATP	D	Ammonium nitrate-based explosive		
17	Melting point of fat is _____ and melting point of oil is _____				K2	CO-5
	A	Higher, higher	B	Lower, lower		
	C	Lower, higher	D	Higher, lower		
18	Which of the following is an example of fats?				K1	CO-5
	A	Glyceryltrioleate	B	Vegetable ghee		
	C	Coconut oil	D	Groundnut oil		
19	Select the incorrect statement from the following option.				K1	CO-5
	A	Oils are saturated triglyceride	B	Examples of oils are glyceryltrioleate, coconut oil, olive oil, etc		
	C	Oils are liquid at room temperature	D	Oils have lower melting points		
20	Hydrogenolysis is a reaction which leads to the reduction products of _____				K1	CO-5
	A	Aldehyde	B	Ketone		
	C	Alcohol	D	Ester		
	Section B **Answer All questions (5 x 5 = 25)**					
21	A	Why is fermentation important in cocoa processing? What is the role of microorganisms in the fermentation process?			K1	CO-1
		OR				
	B	What are the health benefits and harmful effects of beer and wine?			K1	CO-1
22	A	What are the different uses for aspirin?			K1	CO-2
		OR				
	B	Explain then properties and uses of methylene blue.			K6	CO-2
23	A	Write the Synthesis and uses of chromium oxide			K1	CO-3
		OR				
	B	Describe the preparation and characteristics ofcobalt blue			K5	CO-3
24	A	Write a classification of adhesives?			K1	CO-4
		OR				
	B	Explain the properties and uses of Nitro cellulose			K6	CO-4
25	A	State Saponification value?			K3	CO-5
		OR				
	B	Write a properties and uses of castor oil.			K1	CO-5

Section C Answer ANY THREE Questions (3 x 10 = 30)				
26		Explain the preparation of ethyl alcohol from molasses.	K6	CO-1
27		Discuss the preparation, properties and uses of paracetamol & chlormycetin.	K5	CO-2
28		Explain the synthesis, properties and applications of Zinc oxide.	K6	CO-3
29		Explain the preparation and uses of Gun Powder and Dynamite.	K6	CO-4
30		Describe the Manufacture of cotton seed oil and soybean oil.	K5	CO-5