	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			60

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.
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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.

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 radio active 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

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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.							
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PO 11	Ability to work independently, identify appropriate resources required for a project and manage a project through to completion.							
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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.							

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

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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.							
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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 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
20P2CHCP01	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
20P2CHCP02	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 phase rule, electrochemistry and 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							
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	35
	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).		
Unit - II	**Non- Electrical Experiments**	Periods	40
	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).		
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							
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 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)

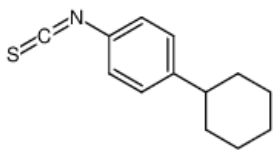
DEPARTMENT OF CHEMISTRY

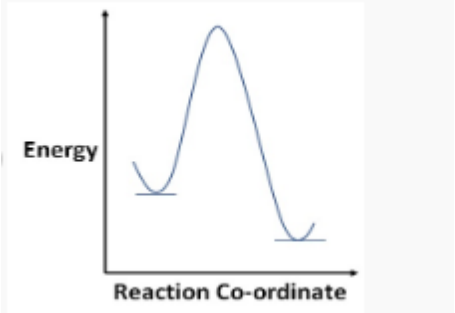
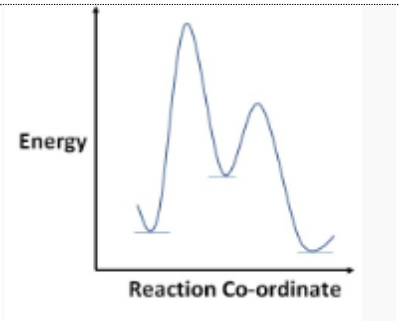
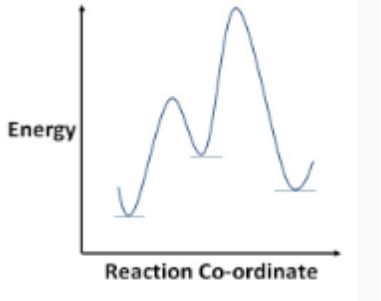
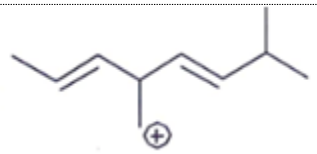
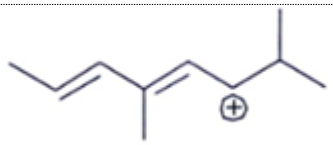
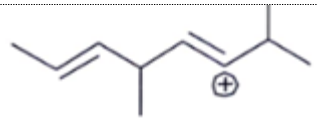
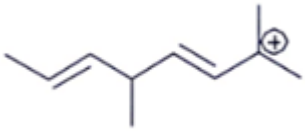
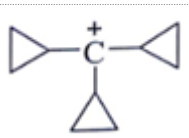
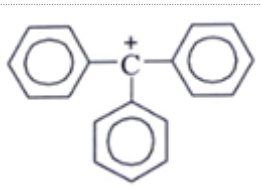
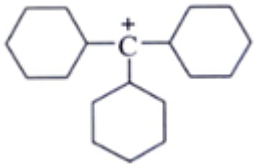
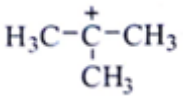
MODEL QUESTION PAPER

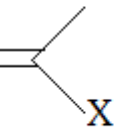
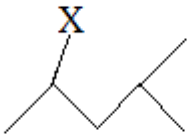
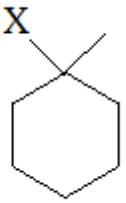
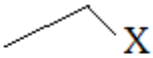
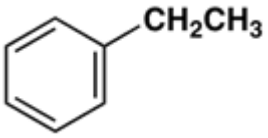
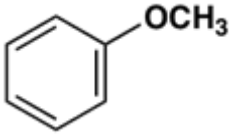
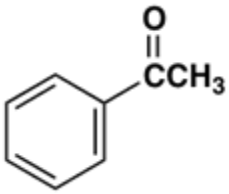
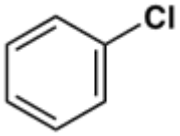
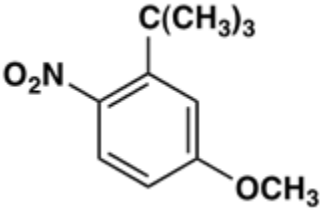
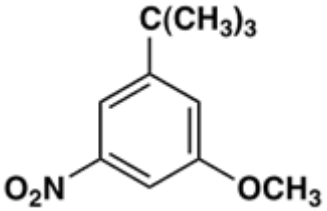
Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	CONCEPTS OF ORGANIC CHEMISTRY AND STEREOCHEMISTRY	I

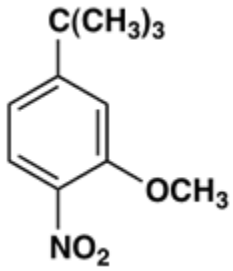
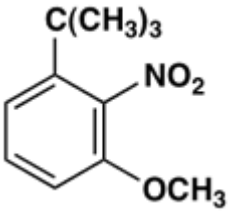
Time: 3 Hr. Max.Marks : 75

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? I.  II.  III.  IV. 				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

TABLE OF SPECIFICATIONS (Question wise – No. of questions)

Outcome/ Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	4	2	1	0	0	0	7
II	4	2	0	1	0	0	7
III	4	2	0	0	1	0	7
IV	4	2	0	1	0	0	7
V	4	2	1	0	0	0	7
Total	20	10	2	2	1	0	35

TABLE OF SPECIFICATIONS (Marks wise – Total marks)

Outcome/ Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	4	10	10	0	0	0	24
II	4	10	0	10	0	0	24
III	4	10	0	0	10	0	24
IV	4	10	0	10	0	0	24
V	4	10	10	0	0	0	24
Total	20	50	20	20	10	0	120

END

QP CODE-20P2CH04

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

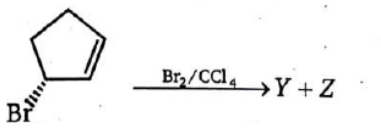
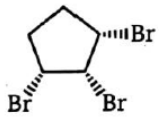
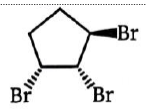
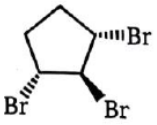
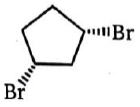
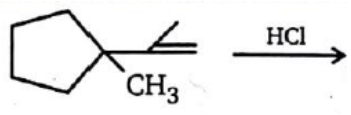
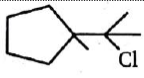
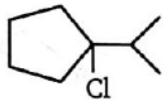
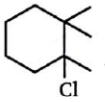
DEPARTMENT OF CHEMISTRY

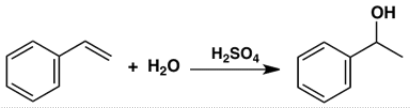
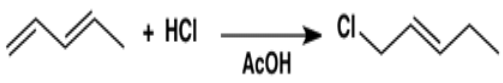
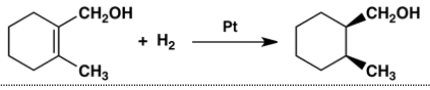
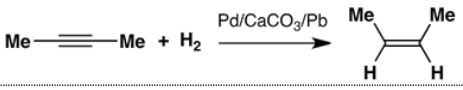
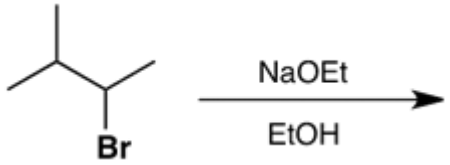
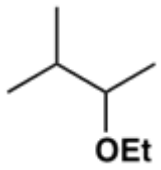
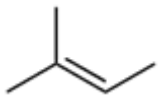
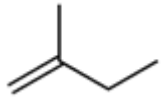
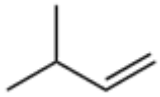
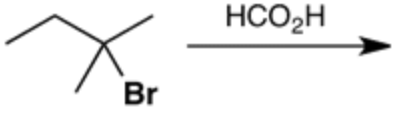
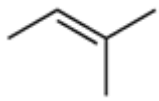
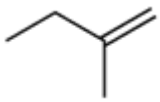
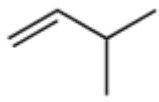
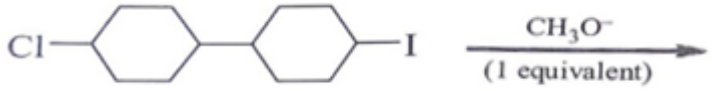
MODEL QUESTION PAPER

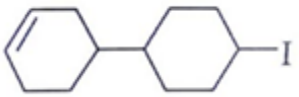
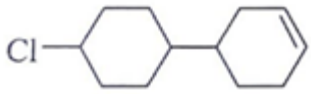
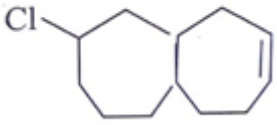
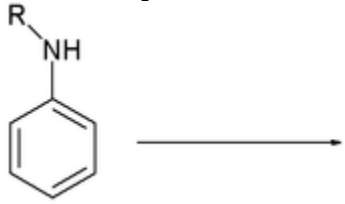
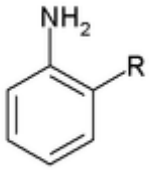
Programme(s)	Title of the Paper	Semester
M.Sc. Chemistry	ORGANIC REACTION MECHANISM	II

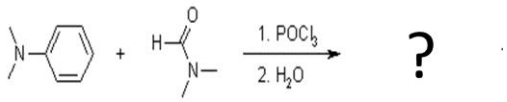
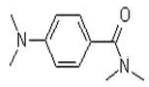
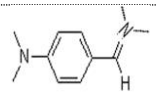
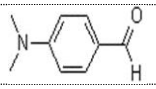
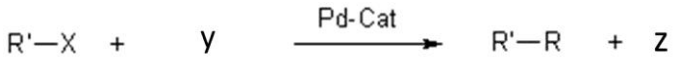
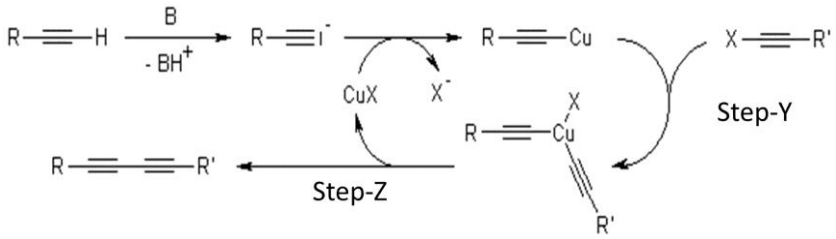
Time: 3 Hr. Max.Marks : 75

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 rearragement	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

TABLE OF SPECIFICATIONS (Question wise – No. of questions)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	4	1	-	1	-	-	6
II	3	2	2	-	-	-	7
III	5	-	2	-	-	-	7
IV	5	2	1	-	-	-	8
V	2	4	-	1	-	-	7
Total	19	10	5	2	-	-	35

TABLE OF SPECIFICATIONS (Marks wise – Total marks)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	5	7	5	5	-	-	20
II	4	10	1	5	-	-	18
III	10	10	1	-	-	-	19
IV	5	10	5	3	-	-	44
V	9	20	5	-	-	-	24
Total	33	57	17	13	-	-	120

END

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 $(Re_2Cl_8)^{2-}$ 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

TABLE OF SPECIFICATIONS (Question wise – No. of questions)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	3	2	0	1	1	0	7
II	3	2	2	0	0	0	7
III	2	3	1	1	0	0	7
IV	4	1	1	1	0	0	7
V	4	2	1	0	0	0	7
Total	16	10	5	3	1	0	35

TABLE OF SPECIFICATIONS (Marks wise – Total marks)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	16	6	0	1	1	0	24
II	7	2	15	0	0	0	24
III	2	16	1	5	0	0	24
IV	12	1	1	10	0	0	24
V	17	6	1	0	0	0	24
	54	31	18	16	1	0	120

END

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

TABLE OF SPECIFICATIONS (Question wise – No. of questions)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	3	0	3	1	0	0	7
II	1	4	1	1	0	0	7
III	1	3	1	2	0	0	7
IV	3	3	1	0	0	0	7
V	3	3	1	0	0	0	7
Total	20	10	2	2	1	0	35

TABLE OF SPECIFICATIONS (Marks wise – Total marks)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	3	0	16	5	0	0	24
II	10	8	1	5	0	0	24
III	5	3	10	6	0	0	24
IV	12	7	5	0	0	0	24
V	11	12	1	0	0	0	24
Total	41	30	33	16	0	0	120

END

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

TABLE OF SPECIFICATIONS (Question wise – No. of questions)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	3	0	0	1	3	0	7
II	1	1	2	0	3	0	7
III	3	2	0	2	0	0	7
IV	2	2	1	2	0	0	7
V	1	6	0	0	0	0	7
Total	10	11	3	5	6	0	35

TABLE OF SPECIFICATIONS (Marks wise – Total marks)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	11	0	0	1	12	0	24
II	1	1	10	0	12	0	24
III	3	6	0	15	0	0	24
IV	2	15	1	6	0	0	24
V	1	23	0	0	0	0	24
	18	45	11	22	24	0	120

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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	$1000^{o}C$	B	$1500^{o}C$		
	C	$2000^{o}C$	D	$2500^{o}C$		
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

TABLE OF SPECIFICATIONS (Question wise – No. of questions)

Outcome /Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	03	03	0	0	01	0	07
II	03	03	01	0	0	0	07
III	03	03	0	01	0	0	07
IV	0	05	01	0	01	0	07
V	02	02	03	0	0	0	07
Total	11	16	05	01	02	0	35

TABLE OF SPECIFICATIONS (Marks wise – Total marks)

Outcome /Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	03	11	0	0	10	0	24
II	03	11	10	0	0	0	24
III	03	11	0	10	0	0	24
IV	00	13	01	0	10	0	24
V	02	02	10	10	0	0	24
Total	11	48	21	20	20	0	120

END

QP CODE-20P2CHE03

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES COLLEGE FOR WOMEN

(Autonomous)

DEPARTMENT OF CHEMISTRY

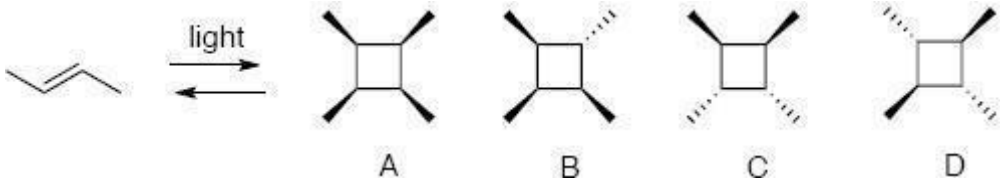
MODEL QUESTION PAPER

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

TABLE OF SPECIFICATIONS (Question wise – No. of questions)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	2	3	1	1	-	-	7
II	2	2	3	-	-	-	7
III	3	-	4	-	-	-	7
IV	1	2	3	1	-	-	7
V	3	3	-	1	-	-	7
Total	11	10	11	3	-	-	35

TABLE OF SPECIFICATIONS (Marks wise – Total marks)

Outcome/Unit	K1 (Remembering)	K2 (Understanding)	K3 (Applying)	K4 (Analyzing)	K5 (Evaluating)	K6 (Creating)	Total
I	6	7	1	10	-	-	24
II	2	6	16	-	-	-	24
III	3	-	21	-	-	-	24
IV	1	6	12	5	-	-	24
V	7	7	-	10	-	-	24
Total	19	26	50	25	-	-	120

END