

RAJA SHANKAR SHAH UNIVERSITY, CHHINDWARA (M.P.)

M.Sc. Industrial Chemistry

Semester - II									
Course Code	Papers	Title	Type	Theory Examination		Internal Assessment		Practical Examination	
				Max.	Mini	Max	Mini	Max	Mini
MICH-201	I	Chemistry of Natural Products	Compulsory	40	14	10	4		
MICH-202	II	Organic Chemistry-II	Compulsory	40	14	10	4		
MICH-203	III	Unit Operations	Compulsory	40	14	10	4		
MICH-204(A)	IV	A. Polymer Science-I	Elective	40	14	10	4		
MICH-204(B)		B. Medicinal Chemistry-I	Elective	40	14	10	4		
MICH-205	V	Laboratory-I	Compulsory					50	25
MICH-206	VI	Laboratory-II	Compulsory					50	25
MICH-207	VII	Assignment & Comprehensive viva-voce	Compulsory	A- Industrial/Company - Ethics, Rules, Regulations & Law B- Environmental Studies/Awareness - Ethics Rules Regulation & Law				50	25

Grand Total Maximum Marks **350**

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Approved
25/5/24
(online)

RAJA SHANKAR SHAH UNIVERSITY, CHHINDWARA (M.P.)

M.Sc. Industrial Chemistry

Semester - II

Paper - I

MICH-201: CHEMISTRY OF NATURAL PRODUCTS

UNIT - I :-

Terpenoids and carotenoids

Classification, occurrence, isolation, general methods of structure determination, isoprene rule, stereochemistry. Synthesis and industrial uses of following representative molecules: citral, geraniol, Menthol, zingiberene, β -carotene.

UNIT - II :-

Alkaloids

Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloid in plants, structure, stereo chemistry, synthesis and biosynthesis of the following; Conine, Nicotine, atropine, Quinine.

UNIT - III :-

Perfumes

Constitution of perfumes, odorous substances, Extraction of perfumes from plants, synthesis of some important synthetic chemicals used in perfume industry esters, phenylethyl alcohol, citronellol, linalool, geraniol, ketone, civetone, muscone, Musk ambrette, musk xylene, coumarin, β -ionone, aldehyde, vanillin, haliotropin, perfume formulation, some representative formulation of rose, jasmine, sandal wood, Fancy perfumes, lavender etc.

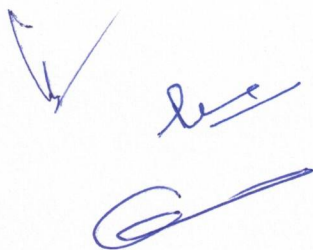


UNIT – IV :-**Carbohydrate and Fermentation Industries**

Manufacture of sugar. Manufacture of starch, dextrin from corn, Potato, rice and tapioca. Industrial alcohol, manufacture of absolute alcohol, Beer, Wine, Distilled spirit, Butyl alcohol, Acetone, Asetic acid, Citric acid, Lactic acid, Oxalic acid etc.

UNIT – V :-**Milk and Milk Products**

Milk and Milk Products, Chemical Compositions, Processing of milk, Types of milk, Analysis of Milk and Composition, Uses and Manufacturer of Various milk products viz cream, butter, ghee, cheese, condensed milk, casein, khoa, milk powder, infant milk food, malted milk powder, ice-cream, fermented milk products.



RAJA SHANKAR SHAH UNIVERSITY, CHHINDWARA (M.P.)

M.Sc. Industrial Chemistry

Semester - II

Paper -II

MICH-202 : ORGANIC CHEMISTRY - II

UNIT- I :-

Stereochemistry

Conformational analysis of cyclohexane, decalins, effect of conformation on reactivity. Steric strain due to unavoidable crowding. Element of symmetry, chirality, molecules with more than one chiral center. Threo and erythro isomers, methods of resolution, optical activity, enantiomeric and diastereomeric compounds, stereospecific and stereoselective synthesis. Optical activity in absence of chiral carbon (biphenyls, allenes, spiranes).

UNIT- II :-

Asymmetric Synthesis

Definition, asymmetric discrimination, reactant control and product control in the enantioselective step. Asymmetric catalytic hydrogenation of olefins, ketones, mechanism of asymmetric hydrogenation. Asymmetric double bond migration, Asymmetric hydrocarboxylation, Asymmetric Diels Alder reaction, Asymmetric oxidation, Asymmetric catalysis by biochemical systems. Economic significance of asymmetric synthesis.

UNIT - III :-

Pericyclic Reactions

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5 hexatriene and allyl systems. Classification of Pericyclic reactions. Woodward — Hoffman correlation diagrams. FMO and PMO approach. Electrocyclic reaction — conrotatory and disrotatory motions, $4n$, $4n+2$ and allyl systems. Cyclo additions — antarafacial and suprafacial additions, $4n$, $4n+2$ systems, 1,3 dipolar cyclo addition. Sigmatropic rearrangements — suprafacial and antarafacial shift of "H", sigmatropic shifts involving carbon moieties 1,3 and 5,5 sigmatropic rearrangements. Claisen, cope and aza — cope rearrangements.

Photochemistry

Cis-trans isomerization, Paterno - Buchi reaction, norrishtype -I and II reactions, photo reduction of ketones, photochemistry of arenes.

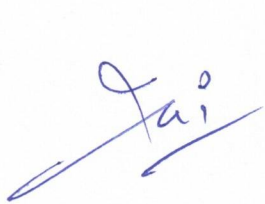


UNIT – IV :-**Oxidation**

Introduction, Different oxidative processes. Hydrocarbons, Alkenes, aromatic rings, saturated C-H groups (activated and unactivated). Alcohols, diols, aldehydes, ketones, carboxylic acids, amines, hydrazines and sulphides. Oxidation with RuO_4 , iodosobenzenediacetate etc.

UNIT – V :-**Reduction**

Introduction different reductive processes. Hydrocarbons alkenes, alkynes, aromatic rings. Carbonyl compounds - aldehydes, ketones, acids. Epoxides, Nitro compounds, azo and oximes.



RAJA SHANKAR SHAH UNIVERSITY, CHHINDWARA (M.P.)

M.Sc. Industrial Chemistry
Semester - II
Paper -III
MICH-203 : UNIT OPERATIONS

UNIT- I :-

Distillation

Introduction, Vapor liquid equilibrium (VLE), Batch and continuous distillation, Reflux ratio, q-line, Azeotropic, Steam and extractive distillation. Equipment: plate columns and packed columns.

Absorption

Introduction, Liquid gas equilibrium selection criteria for solvent minimum gas liquid ratio type of packing. Equipments - packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contactors.

UNIT – II :-

Evaporation

Introduction; Equipments short tube (standard) evaporator, forced circulation evaporator, falling film evaporators, climbing film (upward flow) evaporators, wiped (agitated) film evaporators.

Heat Exchanger

Introduction; Equipments double pipe, Shell and tube, U-tube, Fine tube Heat exchanger

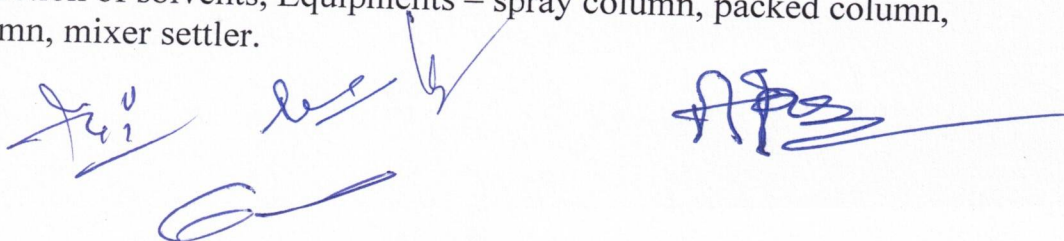
UNIT – III :-

Crystallization

Introduction: Solubility, super saturation, nucleation, crystal growth, Equipment - tank crystallizer, agitated crystallizer, evaporator crystallizer.

Extraction

Introduction : selection of solvents, Equipments – spray column, packed column, rotating disc column, mixer settler.



UNIT – IV :-**Filtration**

Introduction, Filter media and filter aids, Equipment - rotatory drum filter, candle filter, bag filter, centrifuge filter.

Size Reduction and size Separation

Plate and frame filter press,

Definition, objectives of size reduction, factors affecting size reduction, ball mill, hammer mill, fluid energy mill.

UNIT-V :-**Drying**

Introduction; free moisture, bound moisture, drying curve, Equipment's - tray drier, rotary dryer, flash dryer and spray dryer.

Mixing

Theory of mixing, solid - solid, solid-liquid and liquid – liquid mixing equipment's

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RAJA SHANKAR SHAH UNIVERSITY, CHHINDWARA (M.P.)

M.Sc. Industrial Chemistry
Semester - II
Paper -IV(A),
MICH-204(A) : POLYMER SCIENCE - I

UNIT -I :-

Concept of polymers

Concept of polymers, polymerization, definition, classification and types, Bonding in polymers. Condensation polymerization — types extent of condensation and degree of polymerization. Cross-linking, gel point and ring opening polymerization. Addition polymerization free radical & Ionic chain transfer and inhibition. Co-ordination polymerization Ziegler copolymerisation — mechanism of copolymers block and graft copolymers. Kinetics of co-polymerisation.

UNIT - II :-

Chemical properties

Hydrolysis, acidolysis, aminolysis, hydrogenation, addition, substitution isomerisation, cyclization and cross linking reactions of polymer.

Polymerization kinetics and Techniques

Free radical, cationic, anionic and radiation, polycondensation, mass, solution, emulsion and suspension polymerizations, Advantages and disadvantages of the techniques and of the products from them.

UNIT - III :-

Molecular Mass

Relative Molecular Mass, m_w , m_n and polydispersibility colligative property measurement and group analysis. Light scattering, ultra centrifugation, osmotic pressure and viscosity methods of molecular mass measurement. Gel permeation chromatography.

Glassy state, glass transition temperature, Mechanisms of glass transitions temperature, Factors influencing the glass transition temp, Relation of glass transitions temperature with molecular weight and melting point. Importance of glass transition temperature, crystallinity of polymers



UNIT—IV :-**Rubber**

Materials and Processing Technology

Introduction, types, thermoplastic elastomers (TPE), compounding and processing technology, vulcanization of elastomers, theory and accelerator action of sulphur vulcanization, non-sulphur vulcanization, ebonite latex technology, some major rubber products.

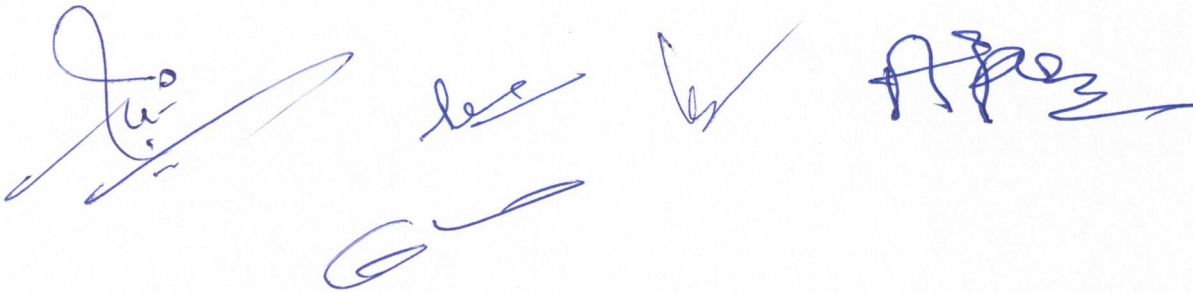
Polymer degradation and stabilizers

Thermal degradation, photo degradation, Oxidative degradation, biological degradation, the role of antioxidants and stabilizers.

UNIT — V :-**Plastics Materials**

Introduction, Synthesis, Properties and Uses of following:

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|-------------------|------------------------|
| 1. Polyethylene | 6. Cellulose plastics |
| 2. Polystyrene | 7. Silicones |
| 3. Acrylic fibers | 8. Poly Vinyl Chloride |
| 4. Polyamides | 9. Polyurethane's |
| 5. Polycarbonates | |

The image shows four distinct handwritten signatures or marks in blue ink. From left to right: 1. A large, stylized signature that appears to be 'J. U.' with a long horizontal stroke extending to the right. 2. A smaller, more compact signature that looks like 'S. S.' with a horizontal stroke below it. 3. A simple checkmark symbol. 4. A signature that appears to be 'A. P.' with a horizontal stroke below it.

RAJA SHANKAR SHAH UNIVERSITY, CHHINDWARA (M.P.)

M.Sc. Industrial Chemistry
Semester - II

Paper -IV(B)

MICH-204(B) : MEDICINAL CHEMISTRY-I

UNIT- I :-

General Pharmacological Principles

- Drug nomenclature, routes of drug administration.
- Pharmacokinetics: Passive diffusion and filtration, specialized transport, absorption, bio-availability, distribution, bio transformation (metabolism), Excretion, clearance, plasma half life, loading and maintenance dose, prolongation of drug action.
- Pharmacodynamics: Principles of drug action, mechanism of drug action, drug response relationship, drug dosage, factors modifying drug action.
- Adverse drug effects.

UNIT - II :-

Antipyretics Analgesics

- Antipyretic drugs: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of paracetamol, acetanilide, aspirin, cincophen, phenazone, mefenamic acid.
- Opoid analgesic or Narcotic analgesic drugs: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Morphenesulphate, codeine, levorphanon tartrate, pethidine hydrochloride.
- Non steroidal anti inflammatory drugs: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Indomethacine, Ibuprofen, Auranofin.

UNIT- III :-

- Sulphonamides: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Sulfanilamide, Sulfathiazole, Sulphadiazine, Sulfacetamide, Mafenide
- Cotrimoxazole, Quinolones and Fluroquinolones: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of cotrimoxazole, ciprofloxacin, norfloxacin.
- Anti Cancer Drugs: Classification, pharmacology, mode of action, adverse effects, synthesis of Cyclophosphamide, Melphalan, Busulfan, Methotrexate.

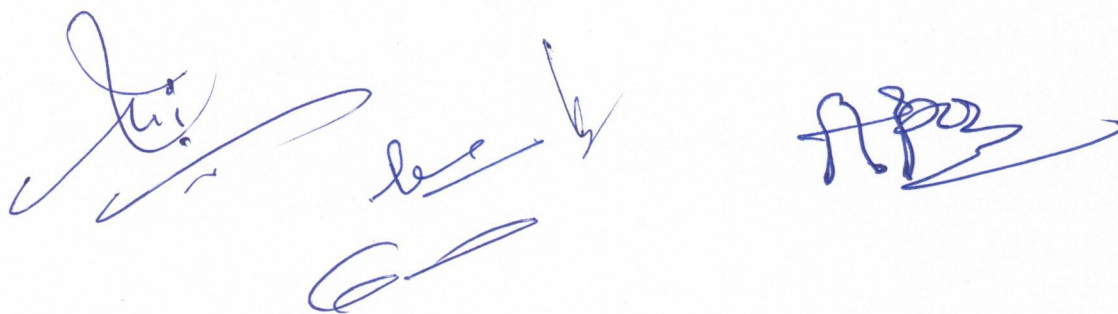


UNIT – IV :-**Antibiotics**

- a) **l-Lactam antibiotics:** Classification, pharmacology, mode of action, adverse effects, synthesis of Penicilline (Benzyl penicilline, cloxacillin, ampiciline) and Cephalosporins (cephalexin).
- b) **Aminoglycosides Antibiotics:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Streptomycin, neomycin.
- c) **Tetracyclines and chloramphenicol:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Tetracycline, Minocycline and Chloramphenicol.
- d) **acrolide Antibiotics:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Erythromycin.
- e) **Treatment of urinary tract infection: Antimicrobial agents**

UNIT –V :-

- a) **AntitubercularDrugs:Classification,** pharmacology, mode of action, adverse effects, synthesis and structure activity relationship ofisoniazid, Rifampin, Streptomycin.
- b) **AntileproticDrugs:Classification,** pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Dapsone, Clofazimine.
- c) **Antimalarial Drugs:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Chloroquine, Primaquin Phosphate.
- d) **Antiamoebic& Antiprotozoal Drugs:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Mtroniadazole, DiloxanideFuroate, Pentamidine.



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M.Sc. Industrial Chemistry

Semester – II

Paper-V

MICH-205 : Laboratory- I

Organic synthesis	1	To synthesize benzanilide from aniline.
	2	To synthesize benzoic acid from benzanilide.
	3	To prepare phthalamide from phthalic anhydride.
	4	To synthesize 2,4,6-tribromoaniline from aniline.
	5	To prepare p-n itroacetan i l i de from acetanilide.
	6	To prepare methyl orange from sulphanilic acid.
	7	To prepare phenyl azo 13-naphthol from aniline.
	8	To prepare 13-naphthyl benzoate from (3-naphthol.
	9	To prepare p-iodoacetanilide from acetanilide.
	10	To synthesize phenyl benzoate from phenol.
	11	Solvent free synthesis of Schiff base using aldehyde and primary

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Semester – II

Paper -VI

MICH-206 : Laboratory- II

Natural products isolation	1	To isolate cellulose from cotton.
	2	To isolate β -carotene from carrot.
	3	To isolate lycopene from tomato.
	4	To prepare glucose from cane sugar.
	5	To isolate caffeine from tea leaves.
	6	To extract oleoresin from red chili.
	7	To extract clove oil from clove buds through distillation and characterization by melting point, TLC and density.
	8	To isolate casein from milk.



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Semester – II

Paper -VII

MICH-207 : Assignment & Comprehensive viva-voce

A- Industrial/Company - Ethics, Rules Regulations & Law

B- Environmental Studies/Awareness – Ethics, Rules, Regulations & Law

