SRI VENKATESWARA UNIVERSITY
B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY
V SEMESTER
(Syllabus under CBCS w.e.f. 2022-23)

Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus with Learning Outcomes, References, Co-curricular Activities & Model Q.P. Pattern)

Structure of SECs for Semester–V

(To choose One pair from the Threealternate pairs of SECs)

Univ. Code	Course NO. 6&7	Name of Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk.	Marks	Credits
	6A	Unit Processes in Organic Synthesis – I	**3**	**25**	**75**	**3**	**3**	**50**	**2**
	7A	Unit Processes in Organic Synthesis – II	**3**	**25**	**75**	**3**	**3**	**50**	**2**
		OR							
	6B	Electro Industrial Chemistry	**3**	**25**	**75**	**3**	**3**	**50**	**2**
	7B	Corrosion and Its Prevention	**3**	**25**	**75**	**3**	**3**	**50**	**2**
		OR							
	6C	Medicinal Chemistry	**3**	**25**	**75**	**3**	**3**	**50**	**2**
	7C	Pesticides and Green Chemistry	**3**	**25**	**75**	**3**	**3**	**50**	**2**

Note-1: *For Semester–V, for the domain subject Industrial Chemistry, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A&7A or 6B&7B or 6C&7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).*

Note-2: *One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.*

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V SEMESTER
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Course 6A: Unit Processes in Organic Synthesis – I

(Skill Enhancement Course (Elective), Credits: 05)
Max Marks: Theory:100 + Practical:50

I. Learning Outcomes:

On completion of this course, the student will be able to:

1. Learn aboutdifferent types of unit processes in chemical industries.
2. Apply the knowledge on newer techniques in industrially important products with the help of various unit processes.
3. Understand unit processes and flow sheet for manufacturing of industrial products through halogenation, nitration, sulphonation, hydrogenation and oxidation reactions.
4. Expertise in operating procedures, hazard analysis, and safe work practices.

II. Syllabus:(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unittests etc.)

Unit-I

Halogenation **12h**

Halogenating agents, thermodynamics, mechanisms and kinetics of halogenation reactions, chlorination in the presence of a catalyst, photohalogenation. Industrial manufacturing process for Chloral, Benzene Hexachloride (BHC), and DDT.

Unit-II

Nitration **12h**

Nitrating agents, aromatic nitration, kinetics and mechanism of aromatic nitration, Gas – phase nitration of paraffinic hydrocarbons, nitrate esters, N-nitro compounds, process equipment for technical nitrations. Industrialprocesses for the manufacture of nitrobenzene.

Unit – III

Sulphonation **12h**

Sulphonating agents and their principal applications, chemical and physical factors in sulfonation, kinetics and mechanism,desulphonation,workup procedures,industrial equipment and technique, transition from batch to continuous processing. Industrial process for manufacture of benzene sulfonic acid by continuous partial-pressure distillation method.

Unit – IV

Hydrogenation **12h**

Catalytic hydrogenation reactions, hydrogenolysis reactions, general principles concerning hydrogenation catalysts,general classification of hydrogenation catalysts, hydrogenation equipment, Industrial processes for hydrogenation of oils and synthesis of methanol.

Unit – V

Oxidation **12h**

Types of oxidative reactions, oxidizing agents, liquid phase oxidation of aniline, furfural with different oxidizing agents. Commercial methods for oxidation of acetaldehyde, cyclohexane. Vapour phase oxidation of naphthalene.

III. Recommended Books:

1. P. H. Groggins: Unit Processes in Organic Synthesis (MGH)
2. F. A. Henglein: Chemical Technology (Pergamon)
3. M. G. Rao and M. Sittings: Outlines of Chemical Technology (EWP)
4. Clausen, Mattson: Principles of Industrial Chemistry
5. H A. Lowenheim and M. K. Moran: Industrial Chemicals
6. Kirk and Othmer: Encyclopedia of Chemical technology.
7. Kent, Riegel's Industrial Chemistry (N-R).
8. S. D. Shukla and G. N. Pandey: A Textbook of Chemical Technology, Vol-II
9. J. K Stille: Industrial Organic Chemistry (P.I I.).

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY

V SEMESTER - W.E.F. 2022-23

COURSE 6A: UNIT PROCESSES IN ORGANIC SYNTHESIS – I

MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.Part B consists of 5 Units. Answer one full question (A or B) from each unit (i.e., Q.No 9 from Unit – I,Q.No 10 from Unit – II, Q.No 11 from Unit – III, Q.No 12 from Unit – IV, Q.No13 from Unit – V). Each question carries 10 marks.

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)

COURSE – 6A: UNIT PROCESSES IN ORGANIC SYNTHESIS – I

(PRACTICAL SYLLABUS)

IV. Laboratory-Skill Outcomes:

At the end of the course students will be able to

1. Understand the apparatus handling technique.
2. Demonstrate a clear understanding of the reactions of key organic functional groups.
3. Perform organic preparations.
4. Acquire skill for workup procedures.
5. Understand the concept of purification of organic compounds.

V. Practical (Laboratory) Syllabus:

Preparations (One experiment from each group to be demonstrated) **30h**

a. Preparation of p-bromoacetanilide
b. Preparationof 2, 4, 6- tribromophenol
c. Nitration of acetanilide
d. Nitration of nitrobenzene.
e. Toluene-p-sulphonic Acid/ Phenyl Toluene–p–sulphonate
f. Preparation of Sulphanilamide.
g. Hydrogenation of Nitrobenzene.
h. Preparation of Benzil.
i. Preparation of benzoic acid from benzyl chloride.
j. Synthesize and Characterize Methyl Orange

VI. Recommended books/References:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009).
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012).
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
4. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

VII. Co-Curricular Activities:

a) Mandatory: (Training of students by teacher on field related skills: 15 hours)

1. **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for not less than 15 hours on field related quantitative techniques for drug synthesis.
2. **For Student**: Individual visit to any one of the local field agencies, research laboratories in universities/research organizations/private sector culminating writing and submission of a hand-written fieldwork/project work Report not exceeding 10 pages in the given format.
3. Max marks for fieldwork/project work Report: 05.

4. Suggested Format for fieldwork/project work: Title page, student details, index page, details of places visited, observations, findings and acknowledgements.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Visits to research organizations and laboratories.
3. Invited lectures and presentations on related topics by field / industrial experts.
4. Assignments.
5. Seminars, workshops, group discussions, quiz, debates etc. (on related topics).
6. Preparation of videos on tools, techniques and applications of industrial processes.

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V SEMESTER
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COURSE 7A: UNIT PROCESSES IN ORGANIC SYNTHESIS – II

(Skill Enhancement Course (Elective), Credits: 05)
Max Marks: Theory:100 + Practical:50

I. Learning Outcomes:

On completion of this course, the student will be able to:

1. Learnt aboutdifferent types of unit processes in chemical industries.
2. Apply the knowledge on newer techniques in industrially important products with the help of various unit processes.
3. Understand unit processes and flow sheet for manufacturing of industrial products through esterification, hydrolysis, amination and alkylation.
4. Expertise in operating procedures, hazard analysis, and safe work practices.

II. Syllabus:(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unittests etc.)

Unit – I

Esterification **12h**

Esterification of carboxylic acid derivatives, esters by addition to unsaturated systems, esters of inorganic acids,technical preparation ofethyl acetate (batch and continuous) and glyceryl trinitrate.

Unit-II

Hydrolysis **12h**

Definition and scope, Hydrolyzing agents, Hydrolysis of carbohydrates, esters and nitrogen compounds. Thermodynamics of ethyl acetate hydrolytic reaction. Factors affecting on the rate of hydrolysis. Manufacture of soap, glycerol and fatty acids.

Unit – III

Amination by reduction **12h**

Methods of reduction.Iron and acid reduction of nitrobenzene – chemical mechanism and chemical and physical factors. Industrial manufacture ofp-phenylenediamine. Reaction conditions for catalytic reduction. Electrolytic reduction and metal – alkali reduction of nitrocompounds.

Unit – IV

Amination by ammonolysis

12h

Aminating agents, survey of amination reactions with one example each, physical and chemical factors affecting ammonolysis,catalysts used in amination reactions, kinetics of ammonolysis. Industrial manufacture continuous process of aniline from chlorobenzene.

Unit – V

Alkylation **12h**

Types of alkylation, alkylating agents, mechanisms for liquid-phase alkylations of hydrocarbons. Factors affecting on the rate of alkylation, equipment for alkylations, alkylation methods for alkyl aryl detergents and alkylate for the petroleum industry.

III. Recommended Books:

1. P. H. Groggins: Unit Processes in Organic Synthesis (MGH)
2. F. A. Henglein: Chemical Technology (Pergamon)
3. M. G. Rao and M. Sittings: Outlines of Chemical Technology (EWP)
4. Clausen, Mattson: Principles of Industrial Chemistry
5. H A. Lowenheim and M. K. Moran: Industrial Chemicals
6. Kirk and Othmer: Encyclopedia of Chemical technology.
7. Kent, Riegel's Industrial Chemistry (N-R).
8. S. D. Shukla and G. N. Pandey: A Textbook of Chemical Technology, Vol-II
9. J. K Stille: Industrial Organic Chemistry (P.I I.).

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B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY

V SEMESTER - W.E.F. 2022-23

COURSE 7A: UNIT PROCESSES IN ORGANIC SYNTHESIS – II

MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.Part B consists of 5 Units. Answer one full question (A or B) from each unit (i.e., Q.No 9 from Unit – I,Q.No 10 from Unit – II, Q.No 11 from Unit – III, Q.No 12 from Unit – IV, Q.No13 from Unit – V). Each question carries 10 marks.

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)

COURSE – 7A: UNIT PROCESSES IN ORGANIC SYNTHESIS – II

(PRACTICAL SYLLABUS)

IV. Laboratory-Skill Outcomes:

At the end of the course students will be able to

1. Understand the apparatus handling technique.
2. Demonstrate a clear understanding of the reactions of key organic functional groups.
3. Perform organic preparations.
4. Acquire skill for workup procedures.
5. Understand the concept of purification of organic compounds.

V. Practical (Laboratory) Syllabus:

Preparations (One experiment from each group to be demonstrated) **30h**

a. Preparation of Phenyl benzoate from phenol.
b. Preparation of benzocaine.
c. Preparation of acetanilide/benzanilide
d. Preparation of benzamide.
e. Hydrolysis of benzamide
f. Hydrolysis of ethyl benzoate/phenyl benzoate
k. Reduction of p-Nitroacetanilide with Iron/acetic acid.
l. Reduction of p-nitrobenzaldehyde by sodium borohydride.
m. Synthesis and Characterization of Flurosene Dye

VI. Recommended books/References:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009).
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012).
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
4. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

VII. Co-Curricular Activities:

a) Mandatory: (Training of students by teacher on field related skills: 15 hours)

1. For Teacher: Training of students by the teacher in the classroom or in the laboratory for not less than 15 hours on field related quantitative techniques for drug synthesis.

2. For Student: Individual visit to any one of the local field agencies, research laboratories in universities/research organizations/private sector culminating writing and submission of a hand-written fieldwork/project work Report not exceeding 10 pages in the given format.

3. Max marks for fieldwork/project work Report: 05.

4. Suggested Format for fieldwork/project work: Title page, student details, index page,

details of places visited, observations, findings and acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Visits to research organizations and laboratories.
3. Invited lectures and presentations on related topics by field / industrial experts.
4. Assignments.
5. Seminars, workshops, group discussions, quiz, debates etc. (on related topics).
6. Preparation of videos on tools, techniques and applications of industrial processes.

B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY
V SEMESTER
(Syllabus under CBCS w.e.f. 2022-23)

Max Marks: 100+50

Course 6-B: ELECTRO INDUSTRIAL CHEMISTRY

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

Students after successful completion of the course will be able to:

1. This course will help strengthen knowledge regarding various furnaces and abrasive materials in industries.
2. To learn about the industrial preparations of alkaline and chlorine.
3. It focuses on fundamental as well as applications of batteries.
4. It will cover different kind of fuel cells and solar cells.

II. Syllabus :(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

UNIT I: ELECTROTHERMAL INDUSTRIES 12 h

Introduction to furnaces. Advantages of electrical furnaces. Classification of electric furnaces. Selection of furnaces.

Abrasives-Kinds of abrasives-Manufacture of artificial abrasives and uses.

1) Silicon carbide or carborundum 2) Calcium carbide 3) Alundum 4) Boron carbide 5) Boron Nitride 6) Boron carbonitride and 7) Synthetic graphite. Uses of abrasives.

UNIT-II: ALKALI AND CHLORINE- I 12 h

Introduction - Common salt - Method of manufacture.

Caustic soda. Different type of cathodes (Diaphragm cells, mercury cells and membrane cells) Cells used -1. Diaphragm cells 2. Porous diaphragm cells-Nelson cell 3. Hooker cell 4.The Dow cell 5. Diamond cell and 6. Vorce cell.

Manufacture of caustic soda and chlorine by using diaphragm cells- Physico-chemical principles.

UNIT-III: ALKALI AND CHLORINE - II 12 h

Mercury cathode cells-The Castner Kellner cell - Modern mercury cells- De-Nora cells-Physico-chemical principles.

Lime soda process for the manufacture of caustic soda.

Deacon's method for the manufacture of chlorine.

Manufacture of Soda ash by 1. Leblanc process 2. Solvay ammonia soda process

3. Dual process and 4. Electrolytic process.

UNIT- IV: BATTERIES **12 h**

Batteries: Primary and secondary batteries, battery components and their role and characteristics of battery. Working of following batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-Ion & Li-poly.

UNIT- V: FUEL CELLS & SOLAR CELLS **12 h**

1. Fuel cells: Introduction, Classification, Choice of electrolyte. Electrodes and requirement of Electrocatalysis. Working of Hydrogen oxygen fuel cell and hydrocarbon – oxygen fuel cell

2. Biochemical Fuel cells - Characteristic, Classification, Mechanisms and

Application. Use of carbon in fuel cells, Fuel cells using Carbon nano materials.

3. Solar cells: Photochemical and photo galvanic conversion.

III. References

1. Industrial Chemistry (including chemical - engineering) - B.K. Sharma - Goel publishing house, Meerut
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1st Edition, S.Chand & Co.
   Ltd, New Delhi, 2006.
3. Stocchi, E. (1990), Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
4. Kent, J. A. (ed) (1997), Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
5. P. C. Jain, M. Jain: *Engineering Chemistry,* Dhanpat Rai & Sons, Delhi.
6. R. Gopalan, D. Venkappayya, S. Nagarajan: *Engineering Chemistry,* Vikas Publications, New Delhi.
7. B. K. Sharma: *Engineering Chemistry*, Goel Publishing House, Meerut
8. O. P. Vermani, A. K. Narula: *Industrial Chemistry,* Galgotia Publications Pvt. Ltd., New Delhi.
9. R. Narayan and B. Viswanathan, Chemical and Electrochemical Energy Systems, University Press, 1998.
10. C. Vincent and B. Scrosati, Modern Batteries, An introduction to Electrochemical Power Sources, Arnold, 1997.
11. M. Sharon and M. Sharon, Nano Forms of Carbon and its Application, Monad Nano Tech, Mumbai, 2007.
12. S. P. Sukhatme, Solar Energy Principles of Thermal Collection and Storage, Tata McGraw Hill, 2006

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V SEMESTER - W.E.F. 2022-23

COURSE 6-B: ELECTRO INDUSTRIAL CHEMISTRY

MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.Part B consists of 5 Units. Answer one full question (A or B) from each unit (i.e., Q.No 9 from Unit – I,Q.No 10 from Unit – II, Q.No 11 from Unit – III, Q.No 12 from Unit – IV, Q.No13 from Unit – V). Each question carries 10 marks.

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
2.	
3.	
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7.	
8.	

(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)

***Course6-B*: ELECTRO INDUSTRIAL CHEMISTRY -PRACTICAL SYLLABUS**

IV. Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. Will be able to understand basics in designing a electrochemical cell.
2. Various synthetic strategies for preparation of good electrochemical support material for electrodes in fuel cells as well as batteries will be undertaken
3. Develop skills of working and set up of electrochemical cells (potentiometry and pH-metry, conductometry).

V. Practical (Laboratory) Syllabus: (30hrs) (Max.50 Marks)

1. Construct a Daniel cell and determine the voltage of the cell at varying concentration.
2. Determination of electrochemical equivalent of copper.
3. Determination of cell constant.
4. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
5. Determination of temperature dependence of e.m.f of a cell.
6. Determination of solubility and solubility product of sparingly soluble salt conductometrically.

(Conductometric titration of Lead Nitrate against Sodium Sulphate and to determine the solubility of Lead Sulphate.)

VI. Lab References:

1.O. P. Virmani and A.K. Narula, Applied Chemistry theory and Practice, New Age, International Publishers, II Edition.

2. Robert Bruce Thompson, Illustrated Guide to Home Chemistry Experiments O'Reilly Media. Inc.

3. S. W. Rajbhoj and Dr. T. K. Chondhekar, Systematic Experimental Physical Chemistry, Anjali Publication Aurangabad.

VII. Co-Curricular Activities

a) Mandatory :*(Lab/field training of students by teacher :(lab: 10+ fields: 05*):

1. For Teacher: Training of students by the teacher in laboratory and field for not less than15 hours on the field techniques/skills of how the electric furnaces work, how to prepare chlorine and caustic soda in industry and also working of batteries and solar cells.

2. For Students: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observes the furnaces. Write their

observations and submit a hand written fieldwork/project work report not exceeding10 pages in the given format to the teacher.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work**:** *Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.*

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics), collection of relevant videos and material.
3. Visits of abilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts.

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V SEMESTER
(Syllabus under CBCS w.e.f. 2022-23) Max Marks: 100+50
Course 7-B: CORROSION AND ITS PREVENTION

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

- This course will create awareness of corrosion and its control process
- It focuses on protective metallic coatings for prevention of corrosion
- It focuses on protective coatings of materials.
- It covers about the insulating materials in electric industries and also aware about semiconductors.

UNIT-I: CORROSION AND ITS CONTROL **12 h**

CORROSION AND ITS CONTROL – Introduction - Economic aspects of corrosion - Dry or Chemical Corrosion - Wet or electrochemical corrosion - Mechanism of Electrochemical Corrosion.

Galvanic Corrosion - Concentration Cell Corrosion - Differential aeration corrosion - Pitting Corrosion - Underground or soil corrosion - Passivity.

UNIT-II: CORROSION AND ITS CONTROL **12 h**

Factors Influencing Corrosion - Microbiological Corrosion Atmospheric corrosion – Corrosion Control - Proper designing - Using pure metal - Using metal alloys.

Chemical conversion – Coating - Phosphating - Chromising - Treatment of metal surfaces hot dipping - Use of inhibitors.

UNIT-III: PROTECTIVE COATINGS **12 h**

PROTECTIVE COATINGS - Introduction - Metallic Coatings - Various methods of cleaning articles before electrode position – Electroplate and - Electroplating methods.

Pre-treatment of the surface – Metallic Coatings - Hot Dipping -Cementation or Impregnated Coatings - Sprayed Metal Coatings - Cladding – Vapour Deposition.

UNIT-IV: PAINTS **12 h**

Paints - ingredients and their functions Required Properties of a Paint- Paint Constituents and Their Functions - Manufacture of Paint.

Types of Pigments - Characteristics of pigment - Oils - Uses in Paint Emulsion Paints – Special Paints - Paint Remover Varnishes.

UNIT-V: INSULATORS AND SEMI CONDUCTERS **12 h**

Electrical Insulating Materials - Dielectric properties - Requirements of an Electrical Insulating Material - Classification of insulating material - Electrical Rigid Insulations. Semiconductors - Introduction - Classification – Degenerate semiconductors – Super conductors.

III. References

1. M.G. Fontana: Corrosion Engineering, McGraw Hill International Book Co. London.
2. L.L. Shreir: Corrosion, Vol I and Vol II, Newness Butterworths, Edward Arnold Ltd, London.
3. J.C. Scully: Fundamental of Corrosion, Pergamon Press Inc. New York, USA.
4. V.S. Sastry: Corrosion Inhibitors, Principles & Applications, John Wiley & Sons.
5. C.C. Nathan: Corrosion Inhibitors, NACE, Houston, Texas.
6. Corrosion - Causes and Prevention: Speller. F. N.
7. Material Science mini refresher by H.S. Bawa, Tata publisher India.

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B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY

V SEMESTER - W.E.F. 2022-23

Course 7-B: CORROSION AND ITS PREVENTION

MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.Part B consists of 5 Units. Answer one full question (A or B) from each unit (i.e., Q.No 9 from Unit – I,Q.No 10 from Unit – II, Q.No 11 from Unit – III, Q.No 12 from Unit – IV, Q.No13 from Unit – V). Each question carries 10 marks.

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)

***Course7-B*: CORROSION AND ITS PREVENTION -PRACTICAL SYLLABUS**

IV. Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. Chalk out a plan to decrease the rate of corrosion.
2. Preparation of pigment.
3. To study about the Rate of corrosion with respect to Aluminium and Iron plates
4. To determine the effect of temperature on rate of corrosion

V. Practical (Laboratory) Syllabus :(**30hrs**) (Max.50 Marks)

1. Electroless metallic coatings on ceramic and plastic material.
2. Preparation of pigment (zinc oxide)
3. To determine the rate of corrosion on different metallic plates (Iron, Aluminium) in various concentrations of HCl.
4. To determine the effect of temperature on rate of corrosion in acidic medium.
5. To determine the rate of corrosion on a metallic plate in acidic medium.
6. To determine the rate of corrosion on an Aluminium plate in basic medium.

VI. Lab References:

1. Analytical Chemistry by Gary D. Christian 6th edition Wiley publication.
2. Senior Practical Physical Chemistry, B.D. Khosla, V.C. Garg, Adarsh Gulati, R Chand and Co.
3. Applied Chemistry Theory and Practice, O.P. Virmani, A.K. Narula. New Age International Publishers, 2nd Edition.
4. S.W. Rajbhoj and T. K. Chondhekar, Systematic Experimental Physical Chemistry, Anjali Publication, Second Edition 2000.
5. Sunita Rattan, Experiments in Applied Chemistry, S.K. Kataria & Sons, Second edition, 2008
6. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.:
   New Delhi (2011).
7. UGC practical manual for experimental analysis.

VII. Co-Curricular Activities

a) Mandatory :*(Lab/field training of students by teacher :(lab: 10+ fields: 05*):

1. For Teacher: Training of students by the teacher in laboratory and field for not less than15 hours on the field techniques/skills of corrosion formation observations in nature.

2. For Students: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observes corrosion process and its prevention. Write their observations and submit a hand written fieldwork/project work report notexceeding10 pages in the given format to the teacher. And also observe the semiconductors, insulators used in industry.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work**:** *Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.*

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics), collection of relevant videos and material.
3. Visits of abilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts.

SRI VENKATESWARA UNIVERSITY
B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY
V SEMESTER
(Syllabus under CBCS w.e.f. 2022-23)

COURSE 6C: MEDICINAL CHEMISTRY

(Skill Enhancement Course (Elective), Credits: 05)
Max Marks: Theory:100 + Practical:50

I. Learning Outcomes:

After completion of the course, the student can be able to

1. Understand the terms used in medicinal chemistry and properties of drugs.
2. Acquire knowledge about pharmacokinetics and pharmacodynamics of the drugs.
3. Explain different sources and classes of drugs.
4. Write the nomenclature and synthesis of drugs.
5. Apply the concept of structure activity relationship in studies of drug bioactivity.
6. Explain the mechanism of action of drugs.
7. Describe the causes, treatments of cancer and classification of anticancer agents.

II. Syllabus:(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit – I

Drug's introduction **12h**

Definitions – Activity, potency, leads, analogues. receptors, ligand, pharmacophore, drug. SAR and QSAR with one example. Modern-day drug discovery and design. Desirable properties of drugs – Bioavailability, Solubility, Structure and Stability. Sources of drugs, drug administration.

Unit – II

Drug action **12h**

The pharmacokinetic phase (ADME) – Absorption, Distribution, Metabolism, Excretion. Lead optimisation and ADME. The pharmacodynamic phase introduction. Nomenclature of drugs

– Chemical name, generic name and trade names with examples. Classification of drugs based on Chemical structure, Pharmacological action, Physiological classification.

Unit – III

Drug Synthesis **12h**

Structure, synthesis, mode of action, properties and uses of the following drugs.

Promazine (tranquillizers), Levodopa (antiparkinsonism agents), Frusemide (antihypertensive drugs), Chloroquine (antimalarials), Omeprazole (antiulcer agents), Metformin (antidiabetics).

Unit – IV

Structure Activity Relationship (SAR) of representative drugs **12h**

Phenothiazines (tranquillizers), Sulphonamides (antibacterial) Penicillins and Cephalosporins (antibiotics), 4-substituted quinolines (antimalerials).

Unit – V

Cancer therapy

12h

Cancer introduction, factors responsible for cancer, types of cancer and various treatments of cancer. Classification of chemotherapeutic agents.DNA Alkylating agents and DNA intercalating agents. Natural products as anticancer agents. SAR of Combretastatin A-4.

III. Recommended books/References:

1. Textbook of Medicinal Chemistry Vol I by V. Alagarsamy.
2. Textbook of Medicinal Chemistry Vol II by V. Alagarsamy.
3. Medicinal Chemistry by Ashutosh Kar
4. An Introduction to Medicinal Chemistry fifth edition by Graham L. Patrick.
5. Medicinal Chemistry Second Edition by Gareth Thomas.
6. Fundamentals of Medicinal Chemistry by Gareth Thomas.
7. Textbook of Organic Medicinal and Pharmaceutical Chemistry by Wilson and Gisvold's.
8. Foye's Principles of Medicinal Chemistry by Thomas L. Lemke, David A. Williams, Victoria F. Roche, S. William Zito.
9. Burger′s Medicinal Chemistry and Drug Discovery: Therapeutic Agents: Volume – 5.
10. https://www.cancer.gov/about-cancer
11. https://www.cancer.gov/about-cancer/treatment/types
12. Tubulin-Interactive Natural Products as Anticancer Agents,Journal of Natural Products 2009, 72, 3, 507-515 (Review)
13. Essentials of Foye’s Principles of Medicinal Chemistry by Thomas L. Lemke, David A. Williams, Victoria F. Roche, S. William Zito.

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY

V SEMESTER - W.E.F. 2022-23

COURSE 6C: MEDICINAL CHEMISTRY

MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.Part B consists of 5 Units. Answer one full question (A or B) from each unit (i.e., Q.No 9 from Unit – I,Q.No 10 from Unit – II, Q.No 11 from Unit – III, Q.No 12 from Unit – IV, Q.No13 from Unit – V). Each question carries 10 marks.

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
2.	
3.	
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6.	
7.	
8.	

(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)

COURSE – 6C: MEDICINAL CHEMISTRYPRACTICAL SYLLABUS

IV. Laboratory-Skill Outcomes:

At the end of the course students will be able to

6. Understand the apparatus handling technique.
7. Demonstrate a clear understanding of the reactions of key organic functional groups.
8. Perform synthesis of drugs.
9. Acquire skill for workup procedures.
10. Understand the concept of purification of drugs.
11. Discuss the importance of 'green chemistry' considerations during drug manufacture.

V. Practical (Laboratory) Syllabus:

Drug Preparation (Any Four) **30h**

Aspririn

a) Coumarin–3–Carboxylic Acid
b) Isoniazid
c) Isatin
d) Paracetamol
e) Phenyl-azo-beta-naphthol

VI. Recommended books/References:

1. Advanced practical Medicinal Chemistry by Ashutosh Kar

VII. Co-Curricular Activities:

c) Mandatory: (Training of students by teacher on field related skills: 15 hours)

- **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for not less than 15 hours on field related quantitative techniques for drug synthesis.
- **For Student**: Individual visit to any one of the local field agencies, research laboratories in universities/research organizations/private sector culminating writing and submission of a hand-written fieldwork/project work Report not exceeding 10 pages in the given format.
- Max marks for fieldwork/project work Report: 05.
- Suggested Format for fieldwork/project work: Title page, student details, index page, details of places visited, observations, findings and acknowledgements.
- Unit tests (IE).

d) Suggested Co-Curricular Activities:

- Training of students by related industrial experts.
- Visits to research organizations and laboratories.
- Invited lectures and presentations on related topics by field / industrial experts.

- Assignments.
- Seminars, workshops, group discussions, quiz, debates etc. (on related topics).
- Preparation of videos on tools, techniques and applications of drugs.

SRI VENKATESWARA UNIVERSITY
B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY
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COURSE 7C: PESTICIDES AND GREEN CHEMISTRY

(Skill Enhancement Course (Elective), Credits: 05) Max Marks: Theory:100 + Practical:50

I. Learning Outcomes:

On completion of this course, the student will be able to

1. Understand the basic knowledge of pesticides and their classification.
2. Explain the synthetic methods of pesticides.
3. Acquire knowledge about the different types of pesticide formulations and their use.
4. Explain concepts in green chemistry.
5. State and explain the principles of green chemistry.
6. Identify the need of green chemistry and green synthesis.
7. Think to design and develop materials and processes that reduce the use and generation of hazardous substances in industry.
8. Get ideas of innovative approaches to environmental and societal challenges.
9. Critically analyse the existing traditional chemical pathways and processes and creatively think about bringing environmentally benign reformations in these protocols.

II. Syllabus :(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

UNIT-I

Pesticides **12h**

Introduction to pesticides, advantages and disadvantages of pesticides, types of pesticides – Insecticides, Fungicides, Herbicides, Weedicides, Rodenticides plant growth regulators, Pheromones and Hormones. Brief discussion with examples, Structure and uses.

UNIT-II

Pesticides Synthesis **12h**

Synthesis and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil); Anilides (Alachlor and Butachlor).

UNIT – III

Pesticide Formulations **8h**

Dust and Granules, Wettable powders, seed disinfectant, Surfactants, Emulsifiable concentrates, Aerosols, Sprays, Controlled Release Formulations.

UNIT-IV **14h**

Green Chemistry

Introduction: Definition of green Chemistry, need of green chemistry, Twelve principles of Green Chemistry with their explanations and examples; Green Synthesis-Maximum utilisation of reactants and reagents (atom economy). Selection of solvent: Aqueous phase reactions, Reactions in ionic liquids, Solid supported synthesis, Solvent free reactions (solid phase reactions), Green catalysts: Phase transfer catalysts (PTC) and Biocatalysts.

UNIT-V **14h**

Green Synthesis

Green Synthesis of the following compounds: Styrene, Adipic Acid, Catechol, BHT, Methyl Methacrylate, Urethane, 4- aminodiphenylamine, benzyl bromide, Acetaldehyde, Furfural, Ibuprofen, Paracetamol, Citral.

III. Recommended Books/References:

1. Fundamentals of industrial chemistry – pharmaceuticals, polymers, and business by John A. Tyrell.
2. Riegel's Handbook of Industrial Chemistry ninth edition Edited by James A. Kent.
3. Industrial chemistry by B.K. Sharma. Goel Publishing House, Meerut.
4. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
5. Chemistry of pesticides by N. K. Roy
6. R. Cremlyn: Pesticides, John Wiley.
7. Pesticides Formulations – Van Wade. Velkenburg, 1973.
8. Pesticides Synthesis – Mavy, Kohn, Menn, 1979.
9. V.K. Ahluwalia & M.R. Kidwai: New Trends in Green Chemistry, Anamalaya Publishers (2005).
10. P.T. Anastes & J.K. Warmer: Oxford Green Chemistry- Theory and Practical, University Press (1998).
11. A.S. Matlack: Introduction to Green Chemistry, Marcel Deckkar (2001).
12. Kirchoff, M. & Ryan, M.A. Greener approaches to undergraduate chemistry experiment. American Chemical Society, Washington DC (2002).

SRI VENKATESWARA UNIVERSITY

B.Sc. DEGREE COURSE IN INDUSTRIAL CHEMISTRY

V SEMESTER - W.E.F. 2022-23

COURSE 7C: PESTICIDES AND GREEN CHEMISTRY

MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.Part B consists of 5 Units. Answer one full question (A or B) from each unit (i.e., Q.No 9 from Unit – I,Q.No 10 from Unit – II, Q.No 11 from Unit – III, Q.No 12 from Unit – IV, Q.No13 from Unit – V). Each question carries 10 marks.

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

(P.T.O)

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)

Course – 7C: Pesticides and Green Chemistry (Practical Syllabus)

IV. Laboratory - Skills Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in the laboratory.
2. Learn the procedures of green synthesis.
3. Acquire skills in Microwave assisted organic synthesis.
4. Perform some applications of green synthesis.

V. Practical (Laboratory) Syllabus **30h**

The list of suggestive experiments is given below. However, depending upon available resources, any three experiments may be conducted)

1. Benzoin condensation using Thiamine Hydrochloride as a catalyst (instead of cyanide).
2. Formation of Chalcones – A Greener Alternative.
3. Preparation of Salicylic Acid (Aspirin) by Microwave Assisted Method.
4. Green Synthetic Process for Acetanilide.
5. Green Synthetic Process for Dibenzal Propanone.
6. Green Synthetic Process for trans esterification of vegetable oil to crude bio-diesel.

VI. Recommended Books/References:

1. Anastas, P.T & Warner, J.C. Green Chemistry: Theory and Practice, Oxford University Press (1998).
2. Kirchoff, M. & Ryan, M.A. Greener approaches to undergraduate chemistry experiment. American Chemical Society, Washington DC (2002).
3. Ryan, M.A. Introduction to Green Chemistry, Tinnesand; (Ed), American Chemical Society, Washington DC (2002).
4. Sharma, R.K.; Sidhwani, I.T. and Chaudhari, M.K. I.K. Green Chemistry Experiment: A monograph, International Publishing ISBN 978-93-81141-55-7 (2013).
5. Cann, M.C. and Connelly, M. E. Real world cases in Green Chemistry, American Chemical Society (2008). UGC DOCUMENT ON LOCF CHEMISTRY 83
6. Cann, M. C. and Thomas, P. Real world cases in Green Chemistry, American Chemical Society (2008).
7. Lancaster, M. Green Chemistry: An Introductory Text RSC Publishing, Second Edition, 2010.
8. Pavia, D. L., Lampman, G.M., Kriz, G.S. & Engel, R.G. Introduction to Organic Laboratory Techniques: A Microscale and Macro Scale Approach, W. B. Saunders, 1995.

VII. Co-Curricular Activities:

a) Mandatory: (Training of students by teacher on field related skills: 15 hours)

1. For Teacher: Training of students by the teacher in the classroom or in the laboratory

for not less than 15 hours on field related quantitative techniques for pesticides synthesis and formulations, solid phase green synthesis and biocatalysts.

2. **For Student**: Individual visit to any one of the local field agencies, research laboratories in universities/research organizations/private sector culminating writing and submission of a hand-written fieldwork/project work Report not exceeding 10 pages in the given format.
3. Max marks for fieldwork/project work Report: 05.
4. Suggested Format for fieldwork/project work: Title page, student details, index page, details of places visited, observations, findings and acknowledgements.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Visits to research organizations and laboratories.
3. Invited lectures and presentations on related topics by field / industrial experts.
4. Assignments.
5. Seminars, workshops, group discussions, quiz, debates etc. (on related topics).
6. Preparation of videos on tools, techniques and applications of pesticide synthesis, formulations and green chemistry.