

S-30th May, 2015 AC after Circulars from Circular No.1 &amp; onwards++ - 32 -

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY****CIRCULAR NO.SU/Sci./B.Sc. Syll./31/2015**

It is hereby notified for information to all the concerned that, on the recommendation of the various Board of Studies, Ad-hoc Boards & Committees the Hon'ble Vice-Chancellor has accepted the revised semester-wise syllabi in the Faculty of Science as under on behalf of the Academic Council under Section-14[7] of the Maharashtra Universities Act, 1994 :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Automobile Technology IInd Year, [Three Year Degree Course].	III & IV
[2]	B.Sc. Horticulture IInd Year, [Optional].	III & IV
[3]	B.Sc. Chemistry IIIrd Year, [Optional].	V & VI
[4]	B.Sc. Analytical Chemistry IIIrd Year, [Optional].	V & VI
[5]	B.Sc. Agrochemical & Fertilizer IIIrd Year, [Optional].	V & VI
[6]	B.Sc. Geology IIIrd Year, [Optional].	V & VI
[7]	B.Voc. Multimedia & Animation, [Three Year Degree Course].	I to IV
[8]	B.Voc. [1] Industrial Automation, [2] Automobile & [3] Travel & Tourism, [Three Year Degree Course].	I to VI
[9]	B.Voc. Jewellery Design & Gemology, IInd Year [Three Year Degree Course].	III & IV
[10]	Diploma in Industrial Automation for Community College at University Campus.	

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,  
Aurangabad-431 004.  
REF.NO.ACAD/SU/SCI./  
2015/6860-7259  
Date:- 08-07-2015.

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**Director,**  
**Board of College and**  
**University Development.**

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S-30th May, 2015 AC after Circulars from Circular No.1 & onwards++

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**Copy forwarded with compliments to:-**

- 1] The Director, C.V.E.T., Dr. Babasaheb Ambedkar Marathwada University Campus, Aurangabad.
- 2] The Principals, affiliated concerned colleges, Dr. Babasaheb Ambedkar Marathwada University

**Copy to :-**

- 1] The Controller of Examinations,
  - 2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter, Dr. Babasaheb Ambedkar Marathwada University,
  - 3] The Superintendent, [B.Sc. Unit],
  - 4] The Superintendent, [B.C.S. Unit],
  - 5] The Programmer [Computer Unit-1] Examinations,
  - 6] The Programmer [Computer Unit-2] Examinations,
  - 7] The Record Keeper.
- Dr. Babasaheb Ambedkar Marathwada University.

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**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.**

**SYLLABUS**

**B.Sc. (Chemistry)**

**THIRD YEAR**

**SEMESTER SYSTEM**

**FIFTH / SIXTH SEMETER**

**[Effective from – June- 2015 onwards]**

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGBAD**

**B.Sc. (Chemistry) IN SEMESTER PATTERN FOR THREE YEAR DEGREE**

YEAR	SEMESTER	PAPER NUMBER	PAPER TITLE	Hours	MARKS
First	I	Paper – I	Inorganic Chemistry	45	50
		Paper – II	Organic Chemistry	45	50
		Paper – III	Lab Course I	45	50
	II	Paper – IV	Physical Chemistry	45	50
		Paper – V	Inorganic Chemistry	45	50
		Paper – VI	Lab. Course – II	45	50
Second	III	Paper – VII	Organic Chemistry	45	50
		Paper – VIII	Physical Chemistry	45	50
		Paper – IX	Lab. Course-III	90	100
	IV	Paper – X	Inorganic Chemistry	45	50
		Paper – XI	Physical Chemistry	45	50
		Paper – XII	Lab. Course-IV	90	100
Third	V	Paper – XIII	Physical Chemistry	45	50

		Paper – XIV	Organic Chemistry	45	50
		Paper – XV	Lab. Course-V	90	100
	VI	Paper – XVI	Inorganic Chemistry	45	50
		Paper – XVII	Organic Chemistry	45	50
		Paper – XVIII	Lab. Course-VI	90	100

## **B.Sc. CHEMISTRY**

(Three Year Degree Course)

### **THIRD YEAR**

<b>Paper XIII</b>	<b>Physical Chemistry</b>	<b>Fifth Semester</b>
		<b>(45hrs)</b>
		<b>3 Hrs/ Week</b>
I. Elementary Quantum Mechanics		10 Hrs.
II. Spectroscopy		10 Hrs.
III. Photochemistry		08 Hrs.
IV. Physical Properties and Molecular Structure		10 Hrs.
V. Nano Material		07 Hrs.

<b>Paper XIV</b>	<b>Organic Chemistry</b>	<b>Fifth Semester</b>
		<b>(45hrs)</b>
		<b>3 Hrs/ Week</b>
I. Spectroscopy		16 Hrs.
II. Organometallic Compounds		08 Hrs.
III. Organic Synthesis via Enolates		13 Hrs.
IV. Fats, Oils and Detergents		08 Hrs.

<b>Paper – XV</b>	<b>Lab. Course V</b>	<b>Organic Chemistry and</b>
		<b>(45 Hrs)</b>
		<b>Inorganic Chemistry</b>
		<b>(45 Hrs)</b>

## **B.SC. CHEMISTRY**

(Three Year Degree Course)

### **THIRD YEAR**

<b>Paper XVI</b>	<b>Inorganic Chemistry</b>	<b>Sixth Semester</b>
		<b>(45hrs)</b>
		<b>3 Hrs/ Week</b>
I. Metal-ligand Bonding in Transition Metal Complexes		12 Hrs.
II. Electron Spectra of Transition Metal Complexes		07 Hrs.
III. Organometallic Chemistry		10 Hrs.
IV. Bioinorganic Chemistry		10 Hrs.
V. Chromatography		06 Hrs.

<b>Paper XVII</b>	<b>Organic Chemistry</b>	<b>Sixth Semester</b>
		<b>(45hrs)</b>
		<b>3 Hrs/ Week</b>
I. Heterocyclic Compounds		13 Hrs.
II. Carbohydrates		10 Hrs.
III. Synthetic Polymers		07 Hrs.
IV. Synthetic Dyes and Drugs		15Hrs.

<b>Paper – XVIII</b>	<b>Lab. Course VI</b>	<b>Organic Chemistry &amp;</b>
		<b>(45 Hrs)</b>
		<b>Physical Chemistry</b>
		<b>(45 Hrs)</b>

## **B. SC. THIRD YEAR**

### **Paper XIII**

### **Physical Chemistry [ V<sup>th</sup> Semester]**

**45 Hrs. (3 Hrs/week)**

#### **I Elementary Quantum Mechanics**

**10 Hrs.**

Black body radiation, Planck's radiation law, photoelectric effect, Bohr's modes of hydrogen atom (no derivation) and its defects. Compton effect. De Broglie Hypothesis, the Heisenberg's uncertainty principles, Hamiltonian operator, Schrödinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance.

#### **II Spectroscopy**

**10 Hrs.**

Introduction - Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation. Rotational Spectrum - Diatomic molecules, energy levels of a rigid rotor (semi classical principles), selection rule, rotational spectra of rigid diatomic molecule, determination of bond length, numerical problems.

#### **III Photochemistry**

**08 Hrs.**

Introduction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry, Grothus - Drapper law, Stark-Einstein law, Jablonsiki diagram qualitative description of fluorescence, phosphorescence, non-radiative processes (Internal conversion, Intersystem crossing), quantum yield, photosensitized reactions.

#### **IV Physical properties and molecular structure**

**10 Hrs.**

Optical activity and its measurement, dipole moment and its measurement by temperature change method, magnetic property and its measurement by Guoy



balance method, Applications of optical activity, dipole moment and magnetic property for determination of structure of molecule.

**V Nano Material**

**07 Hrs.**

Introduction to nano-materials Methods of Synthesis - i) High energy ball milling, ii) Physical vapour deposition (PVD) iii) Chemical vapour deposition (CVD) iv) Micro emulsion. Synthesis using micro-organisms and plant extract.

## B. SC. THIRD YEAR

### Paper XIV Organic Chemistry [ V<sup>th</sup> Semester]

45 Hrs. (3 Hrs/week)

#### I Spectroscopy

16 Hrs.

Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (1H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 2, 2 tribromoethane, ethyl acetate, toluene and Acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques. (Combine and single  $\lambda$  max using woodwordfischer rule)

#### II Organometallic Compounds

08 Hrs.

Organomagnesium - compounds: Alkyl Magnesium halides-ethyl magnesium bromide formation, structure and chemical reactions. Organozinc compound-dialkyl zinc formation and chemical reactions, organolithium compound- n-butyllithium formation and chemical reactions.

#### III Organic Synthesis via Enolates.

13 Hrs.

Defination, Active methylene compounds, Preparation of Aceto acetic ester, (Claisen condensation with Mechanism), Acidity of alpha hydrogen, properties and reactions involving formation of mono, di and unsaturated carboxylic acids, also synthesis of ketone, di ketone, 4-methyl uracil from acetoacetic ester, keto-enol tautomerism. Preparation of diethyl malonate, properties and reactions involved in alkylation, formation of mono, di and unsaturated carboxylic acids, and also synthesis of aminoacid and barbituric acids from diethyl malonate.

#### IV Fats, oils and detergents

08 Hrs.

Natural fats, edible and industrial oils of vegetable origin, manufacture of soyabean oil by solvent extraction method and isolation and uses of essential oils.

Types of animals fats and oils and definition of saponification value, iodine value, and acid value. Detergents: Definition, Introduction and preparation of sodium alkyl sulphonate, alkyl benzene sulphonate, and amide sulphonate, (one example each), Cleansing action of detergent.

**B. SC. THIRD YEAR**

**Semester V**

**Paper XV**

**Organic Chemistry**

**Lab Course: V**

**Marks: 50**

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Binary Mixture:

**Separation and Identification of both components**

- i) Benzoic Acid +  $\beta$ -naphthol
- ii) Salicylic Acid + P- nitro aniline
- iii)  $\beta$ -naphthol + Acetanilide
- iv) m-nitroaniline + Naphthalene
- v)  $\alpha$ -naphthol + O-nitroaniline
- vi) Cinnamic Acid + Naphthalene
- vii) Salicylic Acid + Naphthalene
- viii)  $\beta$ -naphthol + m-dinitrobenzene
- ix) Cinnamic Acid + P- nitro aniline
- x) Salicylic Acid +  $\beta$ -naphthol

## Inorganic Chemistry

**Lab Course: V**

**Marks : 50**

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1 Inorganic Qualitative Analysis (Semi-Micro Analysis)

(Atleast five mixtures)

2. Separation of calcium and Barium and estimation of

Ca-volumetrically .

3. Separation of Cu and Ni from binary mixture solution and

estimation of Cu-volumetrically .

4. Estimation of oxalic acid and  $H_2SO_4$  in a given mixture

Solution using NaOH and  $KMnO_4$  solution.

5. Estimation of Fe by potassium dichromate using diphenyl

ammine indicator.

6. Estimation of available chlorine in the given sample of

bleaching powder.

7. Separation of calcium and Barium and estimation of

Ba-gravimetrically.

8. Separation of Cu and Ni from binary mixture solution and

estimation of Ni-gravimetrically

## B. SC. THIRD YEAR

### Paper XVI Inorganic Chemistry [ VI<sup>th</sup> Semester]

45 Hrs. (3 Hrs/week)

#### 1. Metal-Ligand Bonding in Transition Metal Complexes 12 Hrs

Limitations of Valence Bond Theory

An Elementary idea of Crystal Field Theory

Crystal Field Splitting in Octahedral, Tetrahedral and

Square Planar Complexes

Factors affecting Crystal Field Parameters

#### 2. Electronic Spectra of Transition Metal Complexes 7 Hrs

Types of Electronic Transitions

Selection rules for d -d transitions

Spectro -chemical series

Orgel Energy level diagram for  $d^1$ ,  $d^5$  and  $d^9$

Electronic Spectrum of  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$  complex ion.

#### 3. Organometallic Compounds 10 Hrs

Definition, Nomenclature and classification of Organometallic Compounds

Preparation, Properties, Bonding and Applications of alkyls and aryls of - Li,

Al, Hg, Sn and Ti.

A Brief account of metal - ethylenic Complexes

Nature of bonding in metal carbonyls.

#### **4. Bioinorganic Chemistry**

**10 Hrs**

Essential and trace elements in biological processes

Metalloporphyrins with special reference to hemoglobin and myoglobin

Biological role of alkali ( $\text{Na}^+$ ,  $\text{K}^+$ ) and alkaline earth metal ions ( $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ).

Nitrogen fixation

#### **5. Chromatography**

**06 Hrs**

Definition and classification of chromatography

Paper and Thin Layer Chromatography

Method of Development (Ascending, Descending Chromatography)

Locating Technique (UV-light / Chemicals)

R f value

Comparison between paper and TLC

Applications.

## B. SC. THIRD YEAR

### Paper XVII Organic Chemistry [ VI<sup>th</sup> Semester]

45 Hrs. (3 Hrs/week)

#### 1. Heterocyclic Compounds

13 Hrs.

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine. Comparison of basicity of pyridine, piperidine and pyrrole. Condensed Heterocycles: Introduction, Preparation of Quinoline (Skraups Synthesis), Isoquinoline (Bischler - Napirlaski) and Indole (Fischer indole Synthesis).

#### 2. Carbohydrates

10 Hrs.

Defination, Introduction and Classification.

Monsaccharides-Interconversion of Glucose and Fructose, chain lengthening, chain shortening of aldoses. Conversion of Glucose in to mannose. Determination of openchain structure of glucose & pyranose ring structure of glucose . Mechanism of Mutarotation and Introduction to disaccharides (maltose, sucrose and lactose) and

Polysaccharides (Starch and cellulose) without involving structure determination.

#### 3. Synthetic Polymers.

07 Hrs.

Introduction, Classification based on nature of synthesis (without mechanism) with examples. (Addition and condensation polymers). Properties, uses and synthesis of polyvinyl chloride, polyvinyl acetate, polystyrene, polyacrylonitrile, Nylon 6, Nylon 66. Introduction to synthetic and natural rubber, properties, uses and synthesis of Buna N., Neoprene and silicon rubber.



#### **4. Synthetic Dyes and Drugs**

**15 Hrs.**

Synthetic Dyes - Definition, colour and constitution (electronic concept) of dye, classification based on chemical constitution, synthesis of methyl orange, Congo red, malachite green, crystal violet, Alizarin and indigo dyes.

Synthetic Drugs - Definition, introduction, classification of drugs. Properties of ideal drug. Synthesis of chloromycetin, paracetamol, phenacetin, sulphaguainidine.

**B. SC. THIRD YEAR**

**Semester VI**

**Paper XVIII**

**Organic Chemistry**

**Lab Course: VI**

**Marks: 50**

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**Organic Estimation**

- i) Estimation of Carbonyl group by hydrazone formation method
- ii) Estimation of vitamin C in commercial soft drink / Glucon D
- iii) Estimation of ascorbic acid
- iv) Estimation of Saponification value of oil

**Organic Preparation and its purity by TLC**

- i) Preparation of Hydrazobenzene from azobenzene.
- ii) Preparation of Phthalic anhydride from phthalic acid.
- iii) Preparation of 2, 4 dinitrophenyl hydrazone of acetone.
- iv) To prepare picrate of Naphthalene.
- v) To prepare picrate of Anthracene.
- Vi) preparation of p – bromo acetanilide from acetanilide

## Physical Chemistry

**Lab Course: VI**

**Marks: 50**

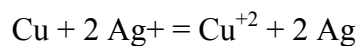
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### Instrumental

1. Determine the Strength of HCl and CH<sub>3</sub>COOH in a given mixture by titrating against strong base conductometrically.
2. Determine the strength of oxalic acid conductometrically using sodium hydroxide solution.
3. To determine empirical formula of ferric -5-sulphosalicylate
4. Determine the amount of Fe<sup>2+</sup> in the given solution potentiometrically
5. To determine the refractive indices of series of salt solutions and to find out concentration of the salt in given unknown solution.

### Non-Instrumental

1. To determine the interfacial tension between two immiscible liquids.
2. To study the effect of addition of an electrolyte NaCl / KCl on the solubility of benzoic acid at room temperature.
3. To determine the standard free energy change  $\Delta G^0$  and equilibrium constant for the reaction.



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