

S-25 March, 2013 AC after Circulars from Circular No.153 &amp; onwards

- 17 -

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY**  
**CIRCULAR NO.ACAD/NP/B.Sc.-Ist Yr./SEM.-I & II/157/2013**

It is hereby notified for information of all concerned that, on the recommendations of the Boards of Studies, Ad-hoc Boards, and Faculty of Science, the Academic Council at its meeting held on 25-03-2013 has accepted the **following revised syllabi for B.Sc. First Year progressively under the Faculty of Science :-**

Sr. No.	Revised Syllabus	
[1]	B.Sc. [Physics]	Semester- I & II,
[2]	B.Sc. [Dairy Science & Technology]	Semester- I & II,
[3]	B.Sc. [Industrial Chemistry]	Semester- I & II,
[4]	B.Sc. [Geology]	Semester- I & II,
[5]	B.Sc. [Chemistry]	Semester- I & II,
[6]	B.Sc. [Botany]	Semester- I & II,
[7]	B.Sc. [Electronics] Science	Semester- I & II,
[8]	B.Sc. [Fisheries]	Semester- I & II,
[9]	B.Sc. [Microbiology]	Semester- I & II,
[10]	B.A. [Statistics]	Semester- I & II,
[11]	B.Sc. [Statistics]	Semester- I & II,
[12]	B.Sc. [Zoology]	Semester- I & II,
[13]	B.Sc. [Textile and Interior Decoration]	Semester- I & II,
[14]	B.Sc. [Home Science]	Semester- I & II,
[15]	B.A. / B.Sc. [Mathematics]	Semester- I & II.

This is effective from the **Academic Year 2013-2014** and onwards.

These syllabi are available on the University Website **www.bamu.net**

All concerned are requested to note the contents of this 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/NP/B.SC.-IST YEAR/  
Sem-I & II/2013/5132-541  
**A.C.S.A.I.No.327[9].**

Date:- 08-05-2013.

\*  
\*  
\*  
\*  
\*  
\*  
\*  
\*\*\*\*\*

*[Signature]*  
**Director,**  
**Board of College and**  
**University Development.**

..2..

S-25 March, 2013 AC after Circulars from Circular No.153 & onwards

- 18 -

:: [2] ::

**Copy forwarded with compliments to :-**

- 1] **The Principals, affiliated concerned Colleges,  
Dr. Babasaheb Ambedkar Marathwada University.**
- 2] **The Director, University Network & Information Centre, UNIC, with  
a request to upload the above all syllabi on University Website  
[www.bamu.net].**

**Copy to :-**

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

==\*\*==

S\*/080513/-

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



**REVISED SYLLABUS**

**OF**

***B.Sc. (Chemistry)***  
***FIRST YEAR***  
***SEMESTER SYSTEM***

**FIRST & SECOND SEMESTER**

**[Effective from - June, 2013-14 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	3	50
		Paper – VIII	Physical Chemistry	3	50
		Paper - IX	Lab. Course-III	3	100
	IV	Paper – X	Inorganic Chemistry	3	50
		Paper – XI	Physical Chemistry	3	50
		Paper – XII	Lab. Course-IV	3	100
Third	V	Paper - XIII	Physical Chemistry	3	50
		Paper – XIV	Organic Chemistry	3	50
		Paper – XV	Lab. Course-V	3	100
	VI	Paper – XVI	Inorganic Chemistry	3	50
		Paper – XVII	Organic Chemistry	3	50
		Paper – XVIII	Lab. Course-VI	3	100

	<b>Note : For Theory Paper 1 Credit = 15 Periods and for practicals paper 1 Credit = 30 periods</b>
--	---

**B.Sc. Chemistry**  
**(Three Year Degree Course)**

<b><u>First Year</u></b>		<b><u>First Semester</u></b>
<b>Paper I</b>	<b>Inorganic Chemistry</b>	<b>(45 Hrs)</b> <b>3 Hrs. / Week</b>
I	Atomic Structure	<b>15 Hrs.</b>
II	Periodic Properties	<b>10 Hrs.</b>
III	S - Block Elements	<b>10 Hrs.</b>
IV	P - Block Elements	<b>10 Hrs.</b>
<b>Paper II</b>	<b>Organic Chemistry</b>	<b>(45 Hrs)</b> <b>3 Hrs / Week</b>
I	Structure and Bonding	<b>06 Hrs.</b>
II	Mechanism of Organic reactions	<b>10 Hrs.</b>
III	Stereo - Chemistry	<b>10 Hrs.</b>
IV	Alkanes	<b>04 Hrs.</b>
V	Alkenes	<b>06 Hrs.</b>
VI	Arenes and Aromaticity	<b>05 Hrs.</b>
VII	Alkyl and Aryl Halides	<b>04 Hrs.</b>
<b>Paper III</b>	<b>Lab Course I</b>	<b>(45 Hrs.)</b> <b>3 Hrs / Week</b>

<b><u>First Year</u></b>		<b><u>Second Semester</u></b>
<b>Paper-IV</b>	<b>Physical Chemistry</b>	<b>(45 Hrs) 3 Hrs. / Week</b>
I	Mathematical Concepts	<b>06 Hrs.</b>
II	Gaseous State	<b>08 Hrs.</b>
III	Liquid State	<b>06 Hrs.</b>
IV	Solid State	<b>07 Hrs.</b>
V	Colloidal State	<b>08 Hrs.</b>
VI	Chemical Kinetics and Catalysis	<b>10 Hrs.</b>
<b>Paper-V</b>	<b>Inorganic Chemistry</b>	<b>(45 Hrs) 3 Hrs / Week</b>
I	Chemistry of Noble gases	<b>05 Hrs.</b>
II	Chemical Bonding	<b>20 Hrs.</b>
III	Nuclear Chemistry	<b>10 Hrs.</b>
IV	Theory of volumetric analysis.	<b>10 Hrs.</b>
<b>Paper-VI</b>	<b>Lab Course-II</b>	<b>(45 Hrs.) 3 Hrs / Week</b>

# First Semester

<b>Paper I</b>	<b>Inorganic Chemistry</b>	<b>(45 Hrs) 3 Hrs. / Week</b>
<b>I</b>	<b><u>Atomic Structure:</u></b>	<b>15 Hrs.</b>
	Atomic orbital's, Quantum numbers, Heisenberg uncertainty principle, shapes of s, p, d orbital's. Aufbau and Pauli exclusion principles. Hund's multiplicity rule. Electronic configurations of the elements, Bohr's atomic model (Qualitative aspect only).	
<b>II</b>	<b><u>Periodic Properties:</u></b>	<b>10 Hrs.</b>
	Atomic and Ionic radii, Ionization Energy, Electron affinity and Electro negativity. Trends in periodic table and application in predicting and explaining the chemical behavior.	
<b>III</b>	<b><u>S-Block Elements:</u></b>	<b>10 Hrs.</b>
	Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their functions in biosystems.	
<b>IV</b>	<b><u>P - Block Elements:</u></b>	<b>10 Hrs.</b>
	Comparative Study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides oxides of groups 13-16. Interhalogen compounds and its types.	

# First Semester

<b>Paper-II</b>	<b>Organic Chemistry</b>	<b>(45 Hrs) 3 Hrs. / Week</b>
<b>I.</b>	<b><u>Structure and Bonding:</u></b>	<b>6 Hrs.</b>
	Localized and delocalized chemical bond; charge transfer complexes, resonance, hyper conjugation, inductive effect, hydrogen bonding, conjugative effect, steric effect.	
<b>II</b>	<b><u>Mechanism of Organic Reactions:</u></b>	<b>10 Hrs.</b>
	Homolytic and heterolytic bond breaking. Types of reagents electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates - carbocations, carbanions, free radicals (with two examples each).	
<b>III</b>	<b><u>Stereochemistry of Organic Compounds :</u></b>	<b>10 Hrs.</b>
	<ul style="list-style-type: none"><li>• Concept of Isomerism - Types of isomerism</li><li>• Optical Isomerism - elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds.</li><li>• Relative and absolute configuration, sequence rules, D and L and R and S systems of nomenclature.</li><li>• Geometric Isomerism - Determination of configuration of geometric isomers. E and Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.</li></ul>	
<b>IV</b>	<b><u>Alkanes :</u></b>	<b>04 Hrs.</b>
	Methods of formation (Koble reaction, Corey - House reaction and decarboxylation of carboxylic acids)	
	Physical properties and Chemical reactions of alkanes	
	Chlorination, Nitration, Sulphonation, Catalytic oxidation.	

- V      Alkenes :** **6 Hrs.**
- Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration and oxidation with  $\text{KMnO}_4$ . Polymerization of alkenes with one example each.
- VI      Arenes and Aromaticity:** **5 Hrs.**
- Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain structure of benzene : molecular formula and Kekule structure. Resonance Structure, MO Picture.
- Aromaticity : The Huckel rule, aromatic ions
- Aromatic electrophilic substitution: General Pattern of the mechanism (Nitration, halogenations and Sulphonation) and Friedel Crafts reaction.
- VII      Alkyl and Aryl halides:** **4 Hrs.**
- Polyhalogen Compounds: Chloroform, Carbon tetrachloride. Methods - formation of aryl halides, nuclear and side chain reaction.

## First Semester

<b>Paper-III</b>	<b>Lab Course-I</b>	<b>45 Hrs. 3 Hrs / Week</b>
<b>I</b>	<b>Volumetric Analysis :</b>	<b>10 Hrs.</b>
	<ul style="list-style-type: none"> <li>• Preparation of 0.1N. NaOH solution and its standardization by given oxalic acid solution.</li> <li>• Preparation of 0.1 N oxalic acid solution and its standardization by given <math>\text{KMNO}_4</math> solution.</li> </ul>	
<b>II</b>	<b>Inorganic Qualitative Analysis :</b>	<b>15 Hrs.</b>
	<ul style="list-style-type: none"> <li>• Identify two acid and two basic radical from the given binary mixture.</li> </ul> <p>a] <math>\text{CdSO}_4 + \text{NH}_4\text{Cl}</math>                      b] <math>\text{BaCO}_3 + \text{Al}_2(\text{NO}_3)_3</math>  c] <math>\text{ZnCO}_3 + \text{KBr}</math>                              d] <math>\text{MnCO}_3 + \text{MgSO}_4</math>  e] <math>\text{NiSO}_4 + \text{MgCO}_3</math></p>	
<b>III</b>	<b>Physical Chemistry</b>	<b>20 Hrs.</b>
	<ul style="list-style-type: none"> <li>• <b>Eudiometer :</b>            <b>Determination of Equivalent weight of mg.</b></li> <li>• <b>Viscometer :</b>            <b>To Determine Viscosity of given liquid (Water / Ethanol) by viscometer .</b></li> <li>• <b>Staglanometer:</b>        <b>To determine surface tension of given liquid.</b></li> <li>• <b>Chemical Kinetics:</b> <b>*To study the effect of acid strength on the hydrolysis of an ester.</b>  <b>*To determine the specific reaction rate of the hydrolysis methyl / ethyl acetate catalyzed by hydrogen ions at room temperature.</b></li> </ul> <p><b>Colorimeter :-        Verification of Lambert-Beer's law using Spectrophotometer. [Colorimeter].</b></p>	

## Second Semester

<b>Paper-IV</b>	<b>Physical Chemistry</b>	<b>(45 Hrs) 3 Hrs. / Week</b>
<b>I</b>	<b><u>Mathematical Concepts :</u></b>	<b>06 Hrs.</b>
	Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like $k^x e^x$ , $x^n$ , $\sin x$ , $\log x$ ; maxima and minima, partial differentiation.	
<b>II</b>	<b><u>Gaseous States:</u></b>	<b>08 Hrs.</b>
	Postulates of kinetic theory of gases, kinetic gas equation, Deduction of Gas Laws : Boyles Law, Charles Law, Grahams Law of diffusion, Avogadro's hypothesis, deviation from ideal behavior, van der Waals equation of state. Critical Phenomena : PV isotherms of real gases.	
<b>III</b>	<b><u>Chemicals Kinetics and Catalysis:</u></b>	<b>10 Hrs.</b>
	Chemical Kinetics and its scope, rate of reaction, factors influencing the rate of reaction - concentration, temperature, pressure, solvent, light, catalyst concentration dependence of rates. Derivation of rate law and characteristics of simple chemical reactions - zero order, first order, second order, Pseudo order, half life. Effect of temperature on rate of reaction. Arrhenius equation, concept of activation energy. <b>Catalysis</b> : Definition, types, and characteristics of catalysis, homogeneous, heterogeneous catalysis - Enzyme catalysis and its application.	
<b>IV</b>	<b><u>Liquid State:</u></b>	<b>6 Hrs.</b>
	Intermolecular forces, structure of liquids (a qualitative description). Difference between solids, liquids and gases. Liquid Crystals: Classification, structure of nematic and cholestric phases.	

- V      Solid State :** **7 Hrs**
- Types of solids, Amorphous, crystalline and difference between them, Miller Indices.
- Laws of crystallography - (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg equation.
- VI      Colloidal State :** **8 Hrs**
- Definition of colloids, classification of colloids.
  - Solids in liquids (sols) : properties - kinetic, optical and electrical; stability of colloids, protective action. Hardy - Schulze Law.
  - Liquids in liquids (emulsions) : types of emulsions, preparation.
  - Liquids in Solids (gels) : classification, preparation and properties, general applications of colloids.

## Second Semester

Paper-V	Inorganic Chemistry - II	45 Hrs 3 Hrs. / Week
<b>I</b>	<b><u>Chemistry of noble gases :</u></b> Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.	<b>5 Hrs.</b>
<b>II</b>	<b><u>Chemical Bonding:</u></b> (A) <u>Covalent Bond</u> - Valence theory and its limitations, directional characteristic of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, Valence shell electron pair repulsion (VSEPR) theory of $\text{NH}_3$ , $\text{SF}_4$ , $\text{ClF}_3$ , $\text{ICl}_2$ and $\text{H}_2\text{O}$ . MO theory, homonuclear ( $\text{He}$ , $\text{N}_2$ and $\text{O}_2$ ) and heteronuclear ( $\text{CO}$ and $\text{NO}$ ) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electro negativity difference. (B) Ionic Bonds - Definitions, Factors affecting ionic bond formation. (C) Hydrogen bonding, Van-der-Waals forces, Metallic bond and its free electron concept.	<b>20 Hrs.</b>
<b>III</b>	<b><u>Nuclear Chemistry:</u></b> Definition; Atomic number, mass number, Isotopes, Isobars mass defect and Binding Energy, Packing fraction N/Z ratio, Radio activity, properties of $\alpha$ , $\beta$ and $\gamma$ , Artificial transmutation. Applications with respect to trans-uranic elements, carbon dating.	<b>10 Hrs.</b>
<b>IV</b>	<b><u>Theory of volumetric Analysis:</u></b> Types of titrations, volumetric apparatus, calibration of pipette and burette. Indicators used in pH - titrations, oxidizing agents used in titrations. Theory of Internal, External and self indicators for redox titration.	<b>10 Hrs.</b>



**First Semester / Second Semester  
Question Paper Pattern for Practical**

---

Lab. Course-I+II  
Paper-III+VI

Time : 06 Hrs.  
Max. Marks : 100.

- |      |    |  |               |
|------|----|--|---------------|
| Q.1. | a) | Inorganic Volumetric Analysis.                             | ... 10 Marks  |
|      | b) | Inorganic Qualitative Analysis.                            | ... 20 Marks  |
| Q.2. | a) | Organic Qualitative Analysis                               | ... 20 Marks  |
|      | b) | Organic Estimation.  | ... 10 Marks  |
| Q.3. | a) | Eudiometer / Viscometer / Staganometer                     | ... 15 Marks  |
|      | b) | Kinetics (Hydrolysis) / Spectrophotometer<br>(Colorimeter) | ... 15 Marks  |
| Q.4. |    | Record Book and Viva-Voce                                  | ... 10 Marks. |

-==\*-

**S\*/-070213/-**  
**S\*/-270213/-**



S-29 Nov., 2013 AC after Circulars from Circular No.55 & onwards

- 42 -

:: [2] ::

[31]	B.Sc. Geology	Semester-III & IV,
[32]	B.A. Statistics with minor changes	Semester-I & II,
[33]	B.A. Statistics	Semester-III & IV,
[34]	B.Sc. Statistics with minor changes	Semester-I & II,
[35]	B.Sc. Statistics	Semester-III & IV,
[36]	B.Sc. Industrial Chemistry	Semester-III & IV,
[37]	B.Sc. Horticultural	Semester-I & II,
[38]	B.Sc. Dry land Agriculture	Semester-I & II,
[39]	B.Sc. Microbiology	Semester-III & IV,
[40]	M.Sc. Computer Science	Semester-I to IV,
[41]	M.Sc. Information Technology	Semester-I to IV.

हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,  
औरंगाबाद-४३१ ००४.  
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/  
६५९९-७०२  
दिनांक :- २७-०५-२०१४.

}}  
}}  
}}  
}}  
}}  
}}  
\*\*\*\*

  
संचालक,  
महाविद्यालये व विद्यापीठ  
विकास मंडळ.

या परिपत्रकाची एक प्रत :-

- १) मा. परिक्षा नियंत्रक, परिक्षा विभाग,
  - २) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,
  - ३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थळावर उपलब्ध करुण देण्यात यावेत.
  - ४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,
  - ५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,
  - ६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,
  - ७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,
  - ८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,
- डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,  
AURANGABAD.



**REVISED SYLLABUS**

**OF**

***B.Sc. Chemistry***  
***SECOND YEAR***  
***[Optional]***

**Third & Fourth Semester**

**[Effective for - June, 2014-15]**

**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)**

<b><u>First Year</u></b>		<b><u>First Semester</u></b>
<b>Paper I</b>	<b>Inorganic Chemistry</b>	<b>(45 Hrs) 3 Hrs. / Week</b>
I	Atomic Structure	<b>15 Hrs.</b>
II	Periodic Properties	<b>10 Hrs.</b>
III	S - Block Elements	<b>10 Hrs.</b>
IV	P - Block Elements	<b>10 Hrs.</b>
<b>Paper II</b>	<b>Organic Chemistry</b>	<b>(45 Hrs) 3 Hrs / Week</b>
I	Structure and Bonding	<b>06 Hrs.</b>
II	Mechanism of Organic reactions	<b>10 Hrs.</b>
III	Stereo - Chemistry	<b>10 Hrs.</b>
IV	Alkanes	<b>04 Hrs.</b>
V	Alkenes	<b>06 Hrs.</b>
VI	Arenes and Aromaticity	<b>05 Hrs.</b>
VII	Alkyl and Aryl Halides	<b>04 Hrs.</b>
<b>Paper III</b>	<b>Lab Course I</b>	<b>(45 Hrs.) 3 Hrs / Week</b>

**B.Sc. Chemistry**  
**(Three Year Degree Course)**

<b><u>First Year</u></b>		<b><u>Second Semester</u></b>
<b>Paper-IV</b>	<b>Physical Chemistry</b>	<b>(45 Hrs) 3 Hrs. / Week</b>
I	Mathematical Concepts	<b>06 Hrs.</b>
II	Gaseous State	<b>08 Hrs.</b>
III	Liquid State	<b>06 Hrs.</b>
IV	Solid State	<b>07 Hrs.</b>
V	Colloidal State	<b>08 Hrs.</b>
VI	Chemical Kinetics and Catalysis	<b>10 Hrs.</b>
<b>Paper-V</b>	<b>Inorganic Chemistry</b>	<b>(45 Hrs) 3 Hrs / Week</b>
I	Chemistry of Noble gases	<b>05 Hrs.</b>
II	Chemical Bonding	<b>20 Hrs.</b>
III	Nuclear Chemistry	<b>10 Hrs.</b>
IV	Theory of volumetric analysis.	<b>10 Hrs.</b>
<b>Paper-VI</b>	<b>Lab Course-II</b>	<b>(45 Hrs.) 3 Hrs / Week</b>

## **B.Sc. Chemistry (Three Year Degree Course)**

### **Second Year (Third Semester)**

<b>Paper VII</b>	<b>Organic Chemistry</b>	<b>Third Semester (45 hrs) 3Hrs / Week</b>
1	Alcohols	06 Hrs
2	Phenols	06 Hrs
3	Aldehydes and Ketones	10 Hrs
4	Carboxylic Acids	09 Hrs
5	Organic Compounds' of Nitrogen	14 Hrs
<b>Paper VIII</b>	<b>Physical Chemistry</b>	<b>(45 hrs) 3Hrs / Week</b>
1	Thermodynamics-I	15 Hrs
2	Thermodynamics-II	20 Hrs
3	Chemical Equilibrium	10 Hrs
<b>Paper IX</b>	<b>Lab Course III (Physical / Inorganic)</b>	<b>90 Hrs</b>

**Second Year (Fourth Semester)**

<b>Paper X</b>	<b>Inorganic Chemistry</b>	<b>Fourth Semester (45 hrs) 3Hrs / Week</b>
1	Chemistry of Elements of First Transition series	10 Hrs
2	Coordination compounds	10 Hrs
3	Chemistry of Lanthanides	06 Hrs
4	Chemistry of Actinides	05 Hrs
5	Acids and Bases	06 Hrs
6	Non Aqueous solutions	08 Hrs
<b>Paper XI</b>	<b>Physical Chemistry- II</b>	<b>(45 hrs) 3Hrs / Week</b>
1	Phase Equilibrium	15 Hrs
2	Electro-Chemistry-I	15 Hrs
3	Electro-Chemistry-II	15 Hrs
<b>Paper XII</b>	<b>Lab Course IV (Physical / Organic)</b>	<b>90 Hrs</b>

## B.Sc. (Second Year) (Third Semester)

### Organic Chemistry

### Paper VII

45 Hrs

#### 1) Alcohols:

06 Hrs.

Definition: *Monohydric Alcohols*: Methods of Formation by reduction of Aldehydes, Ketones, Carboxylic Acids and Esters (one e.g. each) Acidic Nature, Reactions of Alcohols.

*Dihydric Alcohols*: Method of Formation of Ethylene Glycol-industrial method and From Alkenes using  $\text{OsO}_4$ , Chemical Reactions of Ethylene Glycol-nitration, Acylation, Oxidation (Using  $\text{Pb}(\text{OAc})_4$  without Mechanism Pinacol-Pinacolone rearrangement, *Trihydric Alcohols*: Preparation of Glycerol from propane, Reactions of Glycerol.

#### 2) Phenols:

06 Hrs.

Preparation of Phenol from Chlorobenzene, Cumene and Benzene Sulphonic Acid, Physical properties, Acidic Nature of Phenol, Resonance stabilization of Phenoxide Ion. Reactions of Phenols-Electrophilic Aromatics Substitution, Acylation, Carboxylation (Without Mechanism) Reactions with Mechanism-intermolecular Fries Rearrangement, Claisen Rearrangement, Gattermann Synthesis and reamer Tiemann Reaction.

#### 3) Aldehydes and Ketones:

10 Hrs.

*Aldehydes*: Preparation of Aldehydes from Acid Chloride, Gattermann-Koch Synthesis *Ketones*-Preparation from Nitriles and from Carboxylic Acid, Physical Properties of Aldehydes and Ketones. Mechanism of Nucleophilic Additions to Carbonyl Group with particular emphasis on Benzoin, Aldol Knoenenagel condensations, Mannich Reactions. Use of Acetals as Protecting Group. Oxidation of Aldehydes using Chromium Trioxide, Baeyer-Villegger Oxidation of Ketones.

**4) Carboxylic Acids:**

**09 Hrs.**

Acidity of Carboxylic Acids, Effects of substituent's of substituents on Acid strength, preparation of Acetic Acid from  $\text{CO}_2$  from Nitriles, from Acid Chloride, Anhydride, Ester and Amide. Physical Properties and reactions of Carboxylic Acids-Synthesis of Acid Chloride, Ester and Amide, Hell-Volhard-Zelinsky Reaction. Reduction using  $\text{LiAlH}_4$ , Mechanism of Decarboxylation, hydroxyl Acids-Malic, Tartaric and Citric Acid. Methods of Formation and Chemical reactions of Acrylic Acid.

**5) Organic Compounds of Nitrogen:**

**14 Hrs.**

Preparation of *Nitroalkanes*. Nitration of Benzene and Their Reduction in Acidic, Neutral and Basic Media.

*Amines*-Basicity of Amines, Amine Salt as PTC. Preparation of Alkyl and Aryl Amines (Reduction of Nitro Compounds', Nitriles) Reductive Amination, Hoffmann Bromamide Reactions. Reactions of Amines-Electrophilic Aromatic Substitution in *Aryl amines*, Reactions of Amines with Nitrous Acid.

## B.Sc. (Second Year) (Third Semester)

**Physical Chemistry      Paper VIII      45 Hrs (3 Hrs/week)**

**1) Thermodynamics: I      15 Hrs.**

Definition: *of Thermodynamic Terms:* System, Surrounding types of system, intensive and extensive properties. Thermodynamic Process, Concept of heat and work. Work done in reversible and irreversible process, concept of maximum work ( $W_{max}$ ), Numerical Problems.

First law of Thermodynamics: Statement, Definition of Internal energy and Enthalpy.

Heat capacity, heat capacities at constant volume pressure and their relationship. Calculation of  $W, q, du$  and  $dH$  for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Numerical problems, Hess's law of heat Summation and its application.

**2) Thermodynamic-II:      20 Hrs.**

*Second Law of Thermodynamics:* Need for the law, different statement of the law Carnot Cycle and its efficiency, Numerical Problems. Carnot Theorem.

Concept of Entropy: Definition, Physical significance, Entropy as a State Function, Entropy change in Physical change, Entropy as criteria of Spontaneity & Equilibrium Entropy Change in Ideal Gases. Gibbs and Helmholtz Functions: Gibbs Function ( $G$ ) and Helmholtz Function ( $A$ ) as Thermodynamic Quantities.  $A$  and  $G$  as criteria for Thermodynamic Equilibrium and Spontaneity, their Advantage over Entropy change. Variation  $A$  with  $P, V$  and  $T$ .

**3) Chemical Equilibrium:      10 Hrs.**

Equilibrium Constant and Free Energy. Thermodynamic Derivation of Law of Mass Action. Le Chatelier's Principle. Reaction Isotherm and Reaction Isochore. Clapeyron Equation, Clausius-Clapeyron Equation and its Application.

## B.Sc. (Second Year)

### (Third Semester)

#### Lab Course-III

#### Paper IX

90 Hrs (6 Hrs/week)

#### Section A (Physical Chemistry)

##### *Non Instrumental (Any Five)*

i.	To determine critical solution temperature of Phenol- water system.
ii.	To determine solubility of benzoic acid at different Temperature and determine H of dissolution process.
iii.	To determine heat of neutralization ( $\Delta H_n$ ) of Na OH and HCl
iv.	To determine heat of neutralization ( $\Delta H_n$ ) of Na OH and Acetic acid.
v.	Partition coefficient of Benzene-water system using benzoic acid.
vi.	To determine the equilibrium constant for the reaction: $KI + I_2 \rightleftharpoons KI_3$ .
vii.	Determine the molecular mass of polymer from viscometry measurements.
viii.	To investigate the Kinetics of iodination of Acetone.

##### Section B (Inorganic Chemistry)

##### *Gravimetric Estimation: (Any Three)*

i.	Estimation of Zinc gravimetrically as Zinc ammonium phosphate ( $ZnNH_4PO_4$ )
ii.	Estimation of Mn gravimetrically as Manganese Ammonium Phosphate ( $MnNH_4PO_4$ )
iii.	Estimation of Nickel gravimetrically as Ni-DMG
iv.	Estimation of Barium gravimetrically as Ba-Chromate ( $BaCrO_4$ )
v.	Estimation of Aluminum as Aluminum Oxinate.
vi.	To determine the equilibrium constant for the reaction: $KI + I_2 \rightleftharpoons KI_3$
vii.	Determine the molecular mass of polymer from viscometry measurements.
viii.	To investigate the Kinetics of Iodination of acetone.

##### *Complexometric Titration: (Any Two)*

i.	Estimation of Zinc by EDTA solution using EBT indicator.
ii.	Estimation of Nickel by EDTA using Murexide indicator
iii.	Estimation of copper by EDTA using fast sulphon black F indication
iv.	Estimation of Lead By EDTA using Xylenol Orange indicator.

## **B.Sc. (Second Year) (Fourth Semester)**

**(Inorganic Chemistry)      Paper X      45 Hrs (3 Hrs/week)**

**1) Chemistry of Elements of First Transition Series:      10 Hrs.**

General Characteristic features of d-block elements. Properties of the elements of the first transition series: Ionic Size, Atomic Size, Metallic properties, Ionization potential, magnetic properties, Oxidation State.

**2) Co-ordination Compounds:      10 Hrs**

Werner's Co-ordination Theory and its experimental verification effective atomic Number concept, chelates, nomenclature of co-ordination compounds, isomerism in co-ordination compounds, valence bond theory of transition metal complexes.

**3) Chemistry of Lanthanide Elements:      06 Hrs.**

Occurrence and Isolation of Lanthanides, Electronic Configuration Oxidation states, Ionic Radii, Lanthanide Contraction and its Consequences.

**4) Chemistry of Actinides:      05 Hrs.**

Occurrence, Position in the periodic table, Electronic configuration. Oxidation State, chemistry of separation of Np, Pu and Am from U

**5) Acids and Bases:      06 Hrs.**

Arrhenius, Bronsted-Lawry, The Lux-Flood, Solvent System and Lewis Concept of Acids and Bases

**6) Non- Aqueous Solvents:      08 Hrs.**

Physical Properties of a solvent, Types of Solvents and their general Characteristics, Reaction in Non-Aqueous Solvents with reference to liquid  $\text{NH}_3$  and liquid  $\text{SO}_2$ .

**B.Sc. (Second Year)  
(Fourth Semester)**

**Physical Chemistry-II      Paper XI      45 Hrs (3 Hrs/week)**

**1) Phase Equilibrium:      15 Hrs.**

Statement and Meaning of the Terms: *Phase, Component*, Degree of Freedom, Derivation of Phase Rule Equation. Phase Equilibria of the One Component System: Water System. Phase Equilibria of Two Components System: Solid-Liquid Equilibria, Simple Eutectic Pb-Ag. System Desilverisation of Lead.

Solid Solutions: Compound Formation with congruent Melting Point (Mg-Zn) and Incongruent Melting Point ( $\text{FeCl}_3\text{-H}_2\text{O}$ ) System. Freezing Mixture, Acetone-Dry Ice.

Liquid-Liquid Mixture: Raoult's Law and Henry's Law.

Ideal and Non-Ideal system. Azeotropes: HCl-H<sub>2</sub>O and Ethanol-Water System.

Partially Miscible Liquids: Phenol-Water, Trimethyl Amine-Water, Nicotine-water System, Lower and Upper consulate Trimethyl Amine-Water, Nicotine-water system, Lower and Upper Consulate Temperature. Effect of Impurity on Consulate Temperature.

**2) Electro Chemistry-I      15 Hrs.**

Electrical Transport: Conduction in metals and in Electrolyte Solutions. Specific Conductance and equivalent conductance, measurement of equivalent conduction, variation of equivalent and specific conductance with dilution. Numerical problems. Kohlrausch's law and its application. Arrhenius Theory of Electrolyte Dissociation and its limitations. Weak and Strong Electrolytes, Ostwald's Dilution Law, its use and Limitations. Transport Number: Definition, Determination by Hittorfs Method and Moving Boundary Method. Conductometric Titration: Types and its advantages.

### **3) Electrochemistry-II**

**15 Hrs**

Types of Reversible Electrodes: Gas- Metal Ion, Metal-Metal Ion, Metal-Insoluble salt Anion and Redox Electrodes. Nernst Equation, Derivation of Cell, E.M.F. and single Electrode potential, Standard Hydrogen Electrode, Reference Electrodes, Standard Electrode Potential, Sign Conventions, Electro-Chemical Series and its significance. Electrolytic and Galvanic Cells, Reversible and Irreversible Cells, Conventional Representation of Electro Chemical Cells. E.M.F. of a cell and its measurement, Calculation of Thermodynamic Quantities of Cell Reactions (G, H and K)

Definition of pH, pKa-Determination of pH using SHE and Glass Electrode by Potentiometer method. Buffer-Acidic and Basic Buffers, Mechanism of Buffer Action, Henderson-Hasselbalch equation.

Corrosion: Dry (Atmospheric) Corrosion and Wet (Electro-Chemical) Corrosion Electrochemical Theory of Corrosion.

## B.Sc. (Second Year) (Fourth Semester)

Lab Course-IV                      Paper XII                      90 Hrs (3 Hrs/week)

### Section A: Physical Chemistry

#### *Instrumentation: (Any Five)*

- i. To determine normality and strength of HCl using (0.1N) NaOH Solution Conductometrically.
- ii. To determine normality and strength of acetic acid using (0.1N) NaOH solution Conductometrically.
- iii. To determine normality and strength of HCl using (0.1N) NaOH solution by pH-metrically.
- iv. To verify Lambert-Beers Law using  $\text{KMnO}_4$  solution.
- v. To estimate the amount of Sugar using Polarimeter.
- vi. To determine refractive index of ethanol water system.
- vii. To determine indicator constant of indicator colorimetrically.

### Section B: Organic Chemistry

#### Organic Derivatives:-

#### Preparation, Crystallization and Physical Constant. (Any Three)

- |                             |   |                     |                   |
|-----------------------------|---|---------------------|-------------------|
| i. Acetyl Derivatives       | : | a) Aniline          | b) Salicylic Acid |
| ii. Benzoyl Derivatives     | : | a) Aniline          | b) B-naphtol      |
| iii. Hydrolysis Derivatives | : | a) Ethyl Benzoate   | b) Aspirin        |
| iv. Bromo-Derivatives       | : | a) Phenol           | b) Cinnamic Acid  |
| v. Reduction Derivatives    | : | a) M-dinitrobenzene |                   |
| vi. Osazone Derivatives     | : | a) Sucrose          | b) Glucose        |

#### Organic Estimations: (Any Two)

- i. Estimation of nitro group by reduction.
- ii. Estimation of glucose.
- iii. Estimation of ester by hydrolysis.
- iv. Estimation of amides by hydrolysis.

## Pattern of Question Paper

### B.Sc. Second Year

#### Lab Course-III Physical and Inorganic Chemistry.

#### Paper-IX

Time: 06.00 Hours

Max.Marks:100

=====

#### Section A (Physical Chemistry)

50 marks

- Q.1 a. To determine critical solution temperature of phenol water system. **25 Marks**
- Or
- b) Determine the molecular mass of polymer from viscometer measurements.
- Or
- c) Partition coefficient of Benzene water system using benzene acid.
- Or
- d) To investigate the Kinetics of Iodination of Acetone.
- Q.2.a. To determine solidity of benzene acid at different temperature and determine H of dissolution process **25 Marks**
- Or
- b) To determine Hn of NaOH and CH<sub>3</sub>COOH.
- Or
- c) To determine Hn of NaOH and HCl.
- Or
- d) To determine the equilibrium constant for the reaction  $KI + I_2 \rightleftharpoons KI_3$ .
-

### Section B (Inorganic Chemistry)

Q.3 a. Estimation of Zn gravimetrically as  $Zn NH_4 PO_4$  **20 Marks**

Or

b) Estimation of Mn gravimetrically as  $Mn NH_4 PO_4$ .

Or

c) Estimation of Barium gravimetrically as  $BaCrO_4$ .

Or

d) Estimation of Nickel gravimetrically as Ni-DMG.

Or

e) Estimation of Aluminium as Aluminium oxalate.

Q.4. a Estimation of Zinc by EDTA solution using EBT indicator. **20 Marks.**

Or

b. Estimation of Nickel by EDTA solution using Murexide indicator.

c. Estimation of Copper by EDTA Solution using test sulphon black F indicator.

Q.5 Record Book / Viva-Voce **10 Marks.**

## Pattern of Question Paper

### B.Sc. Second Year

#### Lab Course-IV

#### Physical and organic Chemistry

#### Paper-XII

Time: 06.00 Hours

Max.Marks:100

-----

#### Section A (Physical Chemistry)

50 marks

Q.1 a. To determine normality and strength of HCl using (0.1N) NaOH solution Conductometrically. **25 Marks**

Or

b) To determine normality and strength of CH<sub>3</sub>COOH using (0.1N) NaOH solution Conductometrically.

Or

C) To determine Refractive Index of Ethanol-water system.

Or

d) To estimate the amount of sugar using Polarimeter.

Q.2.a. To determine normality and strength of HCl using (0.1N) NaOH solution by pH-metrically. **25 Marks**

Or

b) To Verify Lambert-Beers Law using KMnO<sub>4</sub> solution.

Or

c) To determine Indicator constant of Indicator colorimetric ally.

**Section B (Organic Chemistry)**

**40 Marks.**

- Q.3 a. Estimation of Nitro group by reduction. Zn gravimetrically as Zn NH<sub>4</sub>PO<sub>4</sub>  
Or
- b) Estimation of glucose Mn gravimetrically as Mn NH<sub>4</sub> PO<sub>4</sub>.  
Or
- c) Estimation of Ester by hydrolysis.  
Or
- d) Estimation of amide by hydrolysis.
- Q.4. a Preparation of (organic derivative )  
Its crystallization and physical constant of the prepared derivative. **15 Marks.**
- Q.5. Record Book / Viva-Voce 10 Marks

- = \*\* = -

**S\*/-090414/-**

**S\*/-020514/-**

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.

★  
★  
★  
★  
★  
\*\*\*\*\*

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

..2..

S-30th May, 2015 AC after Circulars from Circular No.1 & onwards++ - 33 -

**:: 2 ::**

**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.

==\*\*==

S\*/-090715/-

**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, Jablonski 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**

---

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**

---

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.



#### **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**

---

**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**

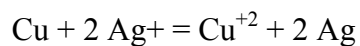
---

### 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.



==\*\*==

S\*/-170615/-