

# TAMIL NADU OPEN UNIVERSITY

## Regulations and Syllabi for B.Sc. CHEMISTRY (Semester Pattern - CBCS)

[w.e.f. Academic Year 2020-21]



Department of Chemistry  
School of Sciences  
Tamil Nadu Open University  
Saidapet, Chennai - 600 015  
Tamil Nadu, INDIA.

# **Bachelor of Science in Chemistry**

## **Regulations**

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### **1. Programme Objectives (PO):**

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While studying the Under Graduate Degree in Chemistry, a student shall able to

- PO1.** Impart knowledge in fundamental aspects of all branches of chemistry
- PO2.** Provide students the scientific skills and chemical knowledge essential for success.
- PO3.** Train the students in various quantitative and qualitative analyses
- PO4.** Enable the students to study of matter and the changes that material substances undergo.
- PO5.** Train students in proper laboratory and safety techniques.
- PO6.** Equip students with effective scientific communication skills.
- PO7.** Foster a commitment to ethical and social responsibilities.

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### **2. Programme Specific Objectives (PSO):**

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While studying the Under Graduate Degree in Chemistry, a student shall able to:

- PSO1.** Explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.
- PSO1.** Gain the theoretical as well as practical knowledge of handling chemicals and apparatus
- PSO1.** Find out the green route for chemical reaction for sustainable development.
- PSO1.** Develop the ability to apply the principles of Chemistry.
- PSO1.** Effectively communicate the results of their work to both chemists and non-chemists in oral or written form
- PSO1.** Expand the knowledge available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist, etc.
- PSO1.** Achieve the skills required to succeed in graduate school, professional school and the chemical industry like cement industries, agro product, paint industries, rubber industries, petrochemical industries, food processing industries, fertilizer industries, etc.

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### **3. Programme Outcomes (POC):**

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After successful completion of Under Graduate Degree in Chemistry, a student will be able to:

**POC1.** Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry.

**POC2.** Think critically, systematically, independently to analyze the chemical problems and to draw a logical conclusion.

**POC3.** Familiarize with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to apprise the students of its relevance in future studies.

**POC4.** Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.

**POC5.** Design, carry out, record and analyze the results of chemical experiments and are familiar with standard safety practices, equipment, procedures, and techniques common to most working laboratories.

### **3. Eligibility for admission:**

Candidates should have passed the Higher Secondary Examination (10+2 pattern) conducted by the Board of Higher Secondary Education, Government of Tamilnadu or any other examination (10+3 pattern) accepted by Syndicate, as equivalent thereto, with Chemistry as one of the subjects in the above said patterns.

**5. Medium:** English

### **6. Duration of the Course:**

The minimum duration for pursuing the degree of Bachelor of Science in Chemistry is THREE years. The maximum duration shall be adhere as per TNOU regulations time to time.

### **7. Admission:**

The candidate's admission for the degree of Bachelor of Science in Chemistry will be taken in Academic year only.

### 8. Course of Study:

The course of study shall comprise instruction in the following courses according to the syllabus.

Year	Semester	Course
I	I	Tamil or Other Language - I
		English -I
		Core Theory - I
		Ancillary - I
		Elective – I
	II	Tamil or Other Language - II
		English -II
		Core Theory - II
		Ancillary - II
		Core Practical - I
II	III	Tamil or Other Language - III
		English -III
		Core Theory - III
		Ancillary - III
		Elective - II
	IV	Tamil or Other Language - IV
		English -IV
		Core Theory - IV
		Ancillary - IV
		Core Practical - II
Elective - III		
III	V	Core Theory - V
		Core Theory - VI
		Core Theory - VII
		Core Theory - VIII
		Core Practical - III
	VI	Core Theory - IX
		Core Theory - X
		Core Theory - XI
		Core Theory - XII
		Core Practical - IV
		<b>Total courses: 31</b>

## 9. Examinations:

The examination for the B.Sc. Degree programme shall consist of theory and practical papers.

(i) **Theory Examinations:** The theory examinations shall be of three hours duration to each paper and conducted at the end of each year. The candidates who failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examinations.

(ii) **Practical Examinations:** The practical examinations shall be of three hours duration to each practical and conducted at the end of each year. The candidates who failing in any practical(s) will be permitted to appear for each failed practical(s) in the subsequent examinations.

## 10. Scheme of Examinations:

The Scheme of examinations in three years of B.Sc. Chemistry programme shall be as follows:

Part	Number of the Course	Title of the Course	Course Code	Examination			
				Credit	Marks Distribution		Maximum Marks
					CIA*	TEE <sup>#</sup>	
<b>1<sup>st</sup> YEAR</b>							
<b>Semester - I</b>							
I	Language	Tamil or other language - I	BFTMS-11	3	30	70	100
II	Language	English - I	BFECS-11	3	30	70	100
III	Core - I	Chemistry - I	BCHE-11	4	30	70	100
	Ancillary - I	Animal Diversity	BZOOSA-11	3	30	70	100
IV	Elective	Office Automation	BCAS-13	2	30	70	100
<b>Semester - II</b>							
I	Language	Tamil or other language - II	BFTMS-21	3	30	70	100
II	Language	English - II	BFECS-21	3	30	70	100
III	Core - II	Chemistry - II	BCHE-21	4	30	70	100
	Ancillary - II	Economic Zoology	BZOOSA-22	3	30	70	100
	Core Practical - I	Volumetric Analysis	BCHE-P1	4	30	70	100

**2<sup>nd</sup> YEAR****Semester - III**

I	Language	Tamil or other language - III	BFTMS-31	3	30	70	100
II	Language	English - III	BFEFS-31	3	30	70	100
III	Core - III	Chemistry - III	BCHES-31	4	30	70	100
	Ancillary - III	Allied Physics-I	BPHYSA-11	3	30	70	100
IV	Elective	Generic Elective (GE)	Learner's Choice	2	30	70	100

**Semester - IV**

I	Language	Tamil or other language - IV	BFTMS-41	3	30	70	100
II	Language	English - IV	BFEFS-41	3	30	70	100
III	Core - IV	Chemistry - IV	BCHES-41	4	30	70	100
	Ancillary - IV	Allied Physics-II	BPHYSA-22	3	30	70	100
	Core Practical - II	Inorganic Semi-micro Qualitative Analysis	BCHES-P2	4	30	70	100
IV	Elective	Environmental Science	CCE	2	30	70	100

**3<sup>rd</sup> YEAR****Semester - V**

III	Core - V	Inorganic Chemistry - I	BCHES-51	4	30	70	100
	Core - VI	Organic Chemistry - I	BCHES-52	4	30	70	100
	Core - VII	Physical Chemistry -I	BCHES-53	4	30	70	100
	Core - VIII	Polymer Chemistry	BCHES-54	4	30	70	100
	Core Practical - III**	Organic Analysis and Estimation	BCHES-P3	4	30	70	100

**Semester - VI**

III	Core - IX	Inorganic Chemistry - II	BCHES-61	4	30	70	100
	Core - X	Organic Chemistry - II	BCHES-62	4	30	70	100
	Core - XI	Physical Chemistry -II	BCHES-63	4	30	70	100
	Core - XII	Environmental Chemistry and Laboratory Hygiene	BCHES-64	4	30	70	100
	Core Practical - IV	Gravimetric Analysis & Physical Chemistry Experiments	BCHES-P4	4	30	70	100

**Total Credits = 106      Total Marks = 3100**

\* Continuous Internal Assessment (CIA)

# Term End Examination (TEE)

\*\* Examination should be conducted at the end of third year

**Elective Courses:**

1. Ability Enhancement Courses (AEC) – (i) Office Automation  
(ii) Environmental Science
2. Skill Enhancement Courses (SEC) – Practical - I, II, III & IV
3. Generic Elective (GE) – Candidates may choose any one course from the list given by the University
4. Discipline Specific Elective (DSE) – Theory papers – V, VI, VII, VIII, IX, X, XI & XII

**11. Question Pattern for Theory Examinations:**

Max. Marks: 70

Time: 3 hours

**PART - A (5×2 = 10 marks)**

Answer all FIVE questions in 50 words

[All questions carry equal marks]

1. From Block - I
2. From Block - II
3. From Block - III
4. From Block - IV
5. From Block- V

**PART - B (4×5 = 20 marks)**

Answer any FOUR questions out of Seven questions in 150 words

[All questions carry equal marks]

6. From Block - I
7. From Block - II
8. From Block - III
9. From Block - IV
10. From Block- V
11. From any Block
12. From any Block

**PART - C (4 × 10 = 40 marks)**

Answer any FOUR questions out of Seven questions in 400 words

[All questions carry equal marks]

13. From Block - I
14. From Block - II
15. From Block - III

16. From Block - IV
17. From Block- V
18. From any Block
19. From any Block

## 12. Passing Minimum:

For theory examination: The candidate shall be declared to have passed the theory examination if the candidate secures not less than 25 marks in the Term End Examinations (TEE) in each theory paper and secures not less than 13 marks in the Continuous Internal Assessment (CIA) [The mark distributions will be adhere as per TNOU norms time to time] and overall aggregated marks is 40 marks in both external and internal taken together. The Candidate must secure the minimum aggregated total of 40 marks for passing in the each course.

Continuous Internal Assessment (CIA)		Term End Examination (TEE)		Overall Aggregated Marks	Maximum Marks
Minimum Mark	Maximum Mark	Minimum Mark	Maximum Mark	CIA + TEE	
13	30	25	70	40	100

For practical examination: The candidate shall be declared to have passed the practical examination if the candidate secures not less than 25 marks in the practical examinations in each practical course and secures not less than 13 marks in the Continuous Internal Assessment (CIA) [The mark distributions will be adhere as per TNOU norms time to time] and overall aggregated marks is 40 marks in both external and internal taken together. The Candidate must secure the minimum aggregated total of 40 marks for passing in the each course.

Continuous Internal Assessment (CIA)		Practical Examination (PE)		Overall Aggregated Marks	Maximum Marks
Minimum Mark	Maximum Mark	Minimum Mark	Maximum Mark	CIA + PE	
13	30	25	70	40	100

## 13. Classification of Successful Candidates:

Candidates who pass all the courses prescribed and who secure

- 75% and above (in first attempt only) will be placed in the ***First class with Distinction.***
- 60% and above in the aggregate of marks will be placed in the ***First Class.***
- 50% and above but below 60% in the aggregate will be placed in the ***Second Class.***
- All other successful candidates will be placed in the ***Third Class.***

## SYLLABUS

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### **B. Sc. CHEMISTRY SYLLABUS - I YEAR (I SEMESTER)**

<b>COURSE TITLE</b>	<b>:</b>	<b>CHEMISTRY - I</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHE-11</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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#### **COURSE OBJECTIVES (CO):**

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While studying the Chemistry - I course; the student will be able to:

- CO1.** Describe about the classification of organic compounds
  - CO2.** Naming the organic compounds and to know the factors influencing the electron availability
  - CO3.** Explain the modern periodic table and its periodic properties
  - CO4.** Able to classify the types and properties of chemical bonds
  - CO5.** Explain the theories and properties of Gases
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#### **COURSE OUTCOMES (COC)**

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After completion of the Chemistry - I, the student will be able to:

- COC1.** Classify the organic compounds
- COC2.** Naming the organic compounds and to know about the factors influencing the electron availability
- COC3.** Explain the modern periodic table and its periodic properties
- COC4.** Describe the types and properties of chemical bonds
- COC5.** Describe the theories and properties of Gases

#### **Block I: Classification of Organic Compounds**

**Unit-1-** Classification based on the nature of carbon skeleton and functional groups and C and H atoms of organic compounds (Primary, Secondary and Tertiary).

**Unit-2-** IUPAC system of nomenclature of alkanes, alkenes, alkynes, cycloalkanes, and aromatic compounds.

**Unit-3-** Factors influencing electron availability - Inductive effect, Electromeric effect, Resonance effect, Mesomerism, Hyperconjugation and Steric effect.

## **Block II: Naming of Organic Compounds**

**Unit-4-** Naming of organic compounds with one functional group - alcohols, phenol, aldehydes, ketones, carboxylic acids, cyano compounds, amines, nitro compounds. (Both aliphatic and aromatic).

**Unit-5-** Naming of organic compounds with two functional groups, more than one carbon chain and one/two hetero atoms present in five and six membered rings.

**Unit-6-** Resonance structures - drawing, conditions and stability of resonance structures.

## **Block III: Modern Periodic table and Periodic properties**

**Unit-7-** Mendeleef's classical and Moseley's modern periodic laws - Rows and Periods.

**Unit-8-** Classification of elements based on electronic configuration - s, p, d & f block elements.

**Unit-9-** Elementary idea of atomic size, atomic radii, ionic radii, shielding effect, bond angle, bond length, ionization energy, electronegativity, electron affinity - their trends along periods and groups.

## **Block IV: Chemical bonding**

**Unit-10-** Ionic bond - properties of ionic compounds and factors favoring the ionic compounds

**Unit-11-** Covalent bond - Lewis theory - Octet rule- covalent character of ionic compounds - Fajan's rules - Hydrogen bonding and its properties.

**Unit-12-** Intermolecular forces - London forces - van der Waals forces - ion dipole-dipole interactions.

## **Block V: Gaseous state**

**Unit-13 -** Ideal gas laws - van der Waals gases - van der Waals equation and determination of van der Waals constants and critical constants - relation between van der Waals constants and critical constants.

**Unit-14-** Concept of ideal gas: Gas laws, Kinetic theory of gases - Viscosity and surface tension - Newton's formula - Stoke's formula- molecular theory of surface tension - spherical and cylindrical drops - surface energy - capillary rise.

### **Text Books:**

1. A text book of Organic Chemistry by R.K. Bansal, NEW AGE; 5th edition edition (2007).
2. Principles of Inorganic Chemistry by B.R. Puri and L.R. Sharma, Milestone Publishers & Distributors/ Vishal Publishing Co.; 33rd edition edition (2017) .

3. Inorganic Chemistry by P.L. Soni, Sultan Chand & Sons (2013).
4. Principles of Physical Chemistry B.R. Puri, L.R. Sharma and M.S. Pathania, Vishal Publishing Co.; 47th edition (2017).
5. A text book of Physical Chemistry by P.L. Sony, O.P.Dharmarha and U.N. Dash Sultan Chand, Sultan Chand & Sons - Tb, (2013).
6. A text book of Organic Chemistry, B.R. Puri, H.M. Chawla.
7. Organic Chemistry by P.H.Pine, McGraw Hill.

### **Reference Books:**

1. Fundamentals of Organic Chemistry by T.W.Graham Solomen, John Wiley & Sons; 4<sup>th</sup> edition (1994).
2. Principle of organic synthesis- R.O.C. Norman and J. M. Coxon.(ELBS).
3. Advanced organic chemistry (McGraw-Hill) J. March.
4. Inorganic Chemistry, J.E. Huheey, Harper and Collins, NY, IV Edition, (2010).
5. Concise Inorganic Chemistry, J. D. Lee, Wiley; Fifth Edition edition (2016).
6. Principles of Physical chemistry, P.W. Atkins, C.J. Clougston, Longman, (1986).

### **Web Links:**

1. <https://youtu.be/pI0xzCfF0Yc>
2. [https://youtu.be/TYU\\_JluleME](https://youtu.be/TYU_JluleME)
3. <https://youtu.be/5BSQG2sbrQw>
4. <https://youtu.be/m9jM8IWxrAE>
5. <https://youtu.be/jb2i8QdNL24>
6. <https://youtu.be/2N117Q1UozI>
7. <https://youtu.be/n8ok1tfpyS8>
8. <https://youtu.be/b6YbRo-D4D8>
9. <https://youtu.be/DcO6HHfr9To>
10. [https://youtu.be/rX6GYo2bS\\_U](https://youtu.be/rX6GYo2bS_U)
11. [https://youtu.be/GhzaIBBM\\_Og](https://youtu.be/GhzaIBBM_Og)
12. <https://youtu.be/QdwzMPwPA3I>
13. <https://youtu.be/0AsD1I5cTP8>
14. <https://youtu.be/WBk7mGb7TKw>

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**B. Sc. CHEMISTRY SYLLABUS - I YEAR - I SEMESTER (Distance Mode)**

**COURSE TITLE : ANIMAL DIVERSITY**

**COURSE CODE : BZOOSA - 11**

**COURSE CREDIT : 3**

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**COURSE OBJECTIVES (CO)**

While studying the Animal Diversity course, the student shall be able to:

**CO1.** Gain the knowledge about classification of animals.

**CO2.** Elaborate study about the paramecium and earthworm.

**CO3.** Elaborate the Lamellidens and Sea star.

**CO4.** Basic concept of various physiological, anatomical structures of animals.

**CO5.** Analysis the biological concepts of birds and mammals.

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**COURSE OUTCOMES (COC)**

After completion of the Animal Diversity, the student will be able to:

**COC1.** Classify the major invertebrate and Chordates.

**COC2.** Detail about paramecium and earthworm.

**COC3.** Explain the Lamellidens and Sea star.

**COC4.** Comparative study of digestive system, respiratory system, circulatory system, urinogenital system and brain of Shark, Frog and Calotes.

**COC5.** Elaborate the circulatory system, urinogenital system and brain of Pigeon and Rabbit.

**BLOCK- I CLASSIFICATION OF MAJOR INVERTEBRATE ORGANISMS**

**Unit-1-** Classification of major Invertebrate organisms

**Unit-2-** Phylum chordata up to classes

**Unit-3-** Class characteristics and diversity with suitable examples

**BLOCK- II PARAMOECIUM, EUGLENA, OBELIA, FASCIOLA HEPATICA AND EARTHWORM**

**Unit-4-** Detailed study of Paramoecium

**Unit-5-** Detailed study of Euglena

**Unit-6-** Detailed study of Obelia

**Unit-7-** Detailed study of Fasciola hepatica

**Unit-8-** Detailed study of Earthworm

### **BLOCK- III PRAWN, LAMELLIDENS AND SEA STAR**

**Unit-9-** Detailed study of Prawn

**Unit-10-** Detailed study of Lamellidens

**Unit-11-** Detailed study of sea star

### **BLOCK- IV SHARK, FROG AND CALOTES**

**Unit-12-** Detailed study of external features, digestive system, respiratory system, circulatory system, urinogenital system and brain of shark

**Unit-13-** Detailed study of external features, digestive system, respiratory system, circulatory system, urinogenital system and brain of frog

**Unit-14-** Detailed study of external features, digestive system, respiratory system, circulatory system, urinogenital system and brain of calotes

### **BLOCK- V PIGEON AND RABBIT**

**Unit-15-** Detailed study of external features, digestive system, respiratory system, circulatory system, urinogenital system and brain of pigeon

**Unit-16-** Detailed study of external features, digestive system, respiratory system, circulatory system, urinogenital system and brain of rabbit

### **Text Book**

1. Life and Diversity from Protozoa to Porifera and Cell Biology I Books.

### **Reference Books:**

1. Ekambaranatha Ayyar, M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol. (Invertebrata), parts I and II.S. Viswanathan (Printers and Publishers) Pvt. Ltd; Madras.
2. Jordan, E.L. and P.S. Verma, 1993. Ivertebrate Zoology, 12th Edition. S. Chand and Co. Ltd, New Delhi.

### **Web Resources:**

1. <https://youtu.be/RZKSac5GISU>
2. <https://youtu.be/2iwOPEGVHVV>
3. <https://youtu.be/QCOrSQUtzIA>

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**B. Sc. CHEMISTRY SYLLABUS - I YEAR - I SEMESTER (Distance Mode)**

**COURSE TITLE : OFFICE AUTOMATION (Elective Course)**

**COURSE CODE : BCAS-13**

**COURSE CREDIT : 2**

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**COURSE OBJECTIVES (CO)**

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While studying the Office Automation course, the student shall be able to:

**CO1.** Know about the history, generation, applications, advantages, characters and memory units of Computers

**CO2.** Know about the introduction of word documents, formatting pages, paragraphs and shortcut keys

**CO3.** Understand the basics of MS Excel, menus, tool bars and spreadsheets.

**CO4.** Acquire knowledge on the introduction to MS Power Point, its templates, creating and formatting the presentation

**CO5.** Get awareness on the characteristics of Internet and E.mail.

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**COURSE OUTCOMES (COC)**

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After completion of the Office Automation course, the student will have the ability to:

**COC1.** Understand the history, generation, applications, advantages, characters and memory units of Computers

**COC2.** Get awareness on the introduction of word documents, formatting pages, paragraphs and shortcut keys

**COC3.** Understand the basics of MS Excel, menus, tool bars and spreadsheets

**COC4.** Acquire knowledge on the introduction to MS Power Point, its templates, creating and formatting the presentation

**COC5.** Get knowledge on the characteristics of Internet and E.mail.

**Block I: Basics of Computer**

**Unit -1-** History & Generation of Computer, Applications of Computer, Advantages of Computer, Characteristics of Computer, Memory Units.

**Block II: MS-Word**

**Unit -2-** Introduction to word –working with documents

**Unit -3-** Formatting page – formatting paragraph- shortcut keys

### **Block III: MS-Excel**

**Unit -4-** MS-Excel: Basics – Menus – Tool Bars

**Unit -5-** Working with spreadsheets- shortcut keys.

### **Block IV: MS-Powerpoint**

**Unit -6-** Introduction to presentation – Templates – Layouts

**Unit -7-** Creating and Formatting presentation.

### **Block V: Introduction to Internet and E.Mails**

**Unit-8-** World Wide Web (www) - History, Working-Web Browsers and its functions, Concept of Search Engines, Searching the Web. **E-Mail:** Creating an email-ID, e-mail reading, saving, printing, forwarding and deleting the mails, checking the mails, viewing and running file attachments, addressing with cc and bcc.

#### **Text Books:**

1. MS-Office 2000 for everyone, Vikas Publishing House Pvt. Ltd, Reprint 2006.

#### **Reference Books:**

1. Nellai Kannan, MS-Office, Nels Publications, 3rd Edition, 2004.
2. John Walkenbach, Herb Tyson, Michael R.Groh, Faithe Wempen and Lisa A.Bucki , Microsoft Office 2010 Bible, Wiley India Pvt. Ltd , Reprint 2010.

#### **Web Resource:**

1. [https://www.youtube.com/watch?v=NqgpZ\\_v4Ne8](https://www.youtube.com/watch?v=NqgpZ_v4Ne8)
2. <https://www.youtube.com/watch?v=bLv1OvUcAoI>
3. [https://www.youtube.com/watch?v=FLst\\_k\\_eWkE](https://www.youtube.com/watch?v=FLst_k_eWkE)
4. <https://www.youtube.com/watch?v=S-nHYzK-BVg&t=2s>
5. <https://www.youtube.com/watch?v=6zVFrdxD0Jk&t=1469s>
6. <https://www.youtube.com/watch?v=Wo80PpySFuk>
7. <https://www.youtube.com/watch?v=xWIBX7TRcSo&t=19s>
8. <https://www.youtube.com/watch?v=IfEuYoO1mO0>
9. <https://www.youtube.com/watch?v=L2JUqOwfG2w&t=1s>
10. [https://www.youtube.com/watch?v=vwHGsvY\\_AIA&t=51s](https://www.youtube.com/watch?v=vwHGsvY_AIA&t=51s)
11. [https://www.youtube.com/watch?v=E9KtIb\\_YKXQ](https://www.youtube.com/watch?v=E9KtIb_YKXQ)
12. <https://www.youtube.com/watch?v=ynuVhMmqLuk>
13. <https://www.youtube.com/watch?v=fpy51JRdMTI&t=14s>

14. <https://www.youtube.com/watch?v=QiVSIvB1xis>
15. <https://www.youtube.com/watch?v=yoJPysX1xzU&t=1s>
16. <https://www.youtube.com/watch?v=yykWOpci8U>
17. <https://www.youtube.com/watch?v=hy2HxEIJnQ>
18. <https://www.youtube.com/watch?v=Gk641O5yPP8>

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## B. Sc. CHEMISTRY SYLLABUS - I YEAR (II SEMESTER)

**COURSE TITLE** : CHEMISTRY - II  
**COURSE CODE** : BCHES-21  
**COURSE CREDIT** : 4

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### COURSE OBJECTIVES (CO)

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While studying the Chemistry - II course, the student will be able to:

**CO1.** Describe the atomic orbitals and their overlapping concepts

**CO2.** Discuss the chemistry of addition and eliminations reactions

**CO3.** Interpret the liquid state of molecules and their properties

**CO4.** Explain the types and applications of pesticides, insecticides, fungicides, repellants, fertilizers and petrochemicals

**CO5.** Analyze the bond disconnections and its properties

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### COURSE OUTCOMES (COC)

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After completion of the Chemistry - II course, the student will be able to:

**COC1.** Describe the atomic orbitals and their overlapping concepts

**COC1.** Explain about the chemistry of addition and eliminations reactions

**COC1.** Discuss the liquid state of molecules and their properties

**COC1.** Categorize the types and applications of pesticides, insecticides, fungicides, repellants, fertilizers and petrochemicals

**COC1.** Acquire knowledge on the bond disconnections and its properties

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### Block I: Atomic orbitals and Hybridization

**Unit-1-** Introduction to atomic orbitals - Quantum numbers - Principal, Azimuthal, Magnetic and Spin quantum numbers and their significances.

**Unit-2-** Pauli's exclusion principle - Hund's rule - Aufbau Principle, (n+1) rule - Stability of half-filled and fully filled orbitals - inert pair effect - VSEPR theory.

**Unit-3-** Hybridization - orbitals overlapping -  $sp$ ,  $sp^2$ ,  $sp^3$ ,  $dsp^2$ ,  $dsp^3$ ,  $d^2sp^3$ ,  $sp^3d^2$  and  $sp^3d^3$  - MO Theory - bonding and anti-bonding orbitals - Comparison of VB and MO theories.

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### Block II: Addition and Elimination reactions

**Unit-4-** General introduction to addition reactions - chemistry of C-C and C=C addition reactions - simple electrophilic and nucleophilic addition reactions - 1, 3- dipolar addition -

Micheal addition - hydroxylation - hydroboration - Mannich - Wittig - Stobbe - Benzoin condensation.

**Unit-5-** General introduction to eliminations reactions - chemistry of E1 and E2 elimination reactions - Chugaev reaction - Cope elimination - Hofmaan degradation.

### **Block III: Liquid state**

**Unit-6-** Nature of cohesive forces in liquids - Vaporization of liquids and their characteristics Trouton's rule and its significance.

**Unit-7-** Surface Tension and Viscosity - Influence of temperature on surface tension and viscosity - molecular, atomic and structural viscosities - Refraction, Refraction Index, Specific Refractive Index - Molar, atomic and structural refractions.

**Unit-8-** Liquid crystals -theory, types and applications of liquid crystals.

### **Block IV: Industrial chemistry**

**Unit-9-** Definition and examples for Pesticide, Insecticides, Fungicides, Repellants and Fertilizers - Inorganic pesticides: Lead arsenate, Paris green, Lime, sulphur, hydrocyanic acid - organic pesticides: DDT and Gammexane.

**Unit-10-** Fertilizer: Nutrients for plant and role of various elements in plants growth – Natural fertilizers - chemical fertilizers - classification of chemical fertilizers: Urea, Super phosphate and Potassium nitrate.

**Unit-11-** Petrochemicals - Introduction - Definition - Origin - Composition - Chemical from natural gas, light Naphtha, petroleum, and Kerosene - Synthetic Gasoline.

### **Block V: Disconnection of bonds**

**Unit-12-** Introduction to homolysis and heterolysis disconnections - definition and stability of carbocations, carbanions and radicals - preparations, physical properties and simple reactions of alkanes, alkenes and alkynes.

**Unit-13-** Mechanism of addition on alkenes - addition of hydrogen, halogen, hydrogen halide, hydroboration, hydroxylation, Ozonolysis and epoxidation.

**Unit-14-** Preparations and reactions of cycloalkanes - cyclo addition, dehalogenation, and Wurtz reaction - 1,2 and 1,4 addition - Diels-Alder reaction - stability of cycloalkanes.

### **Text Books:**

1. Physical Chemistry by G.M. barrow, International Student Edition, McGraw Hill.
2. Advanced Inorganic Chemistry by SatyaPrakash, 17<sup>th</sup> edition.
3. A text book of Organic Chemistry by R.K. Bansal.

4. Inorganic Chemistry by G.C. Shivhare and V.P. Lavania.
5. Physical Chemistry, Bahl and Tuli, S. Chand & Co (P) Ltd.
6. A text book of Organic Chemistry by M.K. Jain.
7. Inorganic Chemistry by P.L. Soni.
8. Modern Inorganic Chemistry by R.C. Agarwal.
9. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
10. Basic principle of Organic Stereochemistry by Dr. P. Ramesh.
11. Stereochemistry, Conformation and mechanisms by Kalsi, Wiley- Eastern Ltd.

### **Reference Books:**

1. Fundamentals of Organic Chemistry by T.W.Graham Solomen, John Wiley & Sons; 4th edition (1994).
2. Principle of organic synthesis- R.O.C. Norman and J. M. Coxon. (ELBS).
3. Advanced organic chemistry (McGraw-Hill) J. March.
4. Inorganic Chemistry, J.E. Huheey, Harper and Collins, NY, IV Edition, (2010).
5. Concise Inorganic Chemistry, J. D. Lee, Wiley; Fifth Edition edition (2016)
6. Principles of Physical chemistry, P.W. Atkins, C.J. Clougston, Longman, (1986).

### **Web Links:**

1. <https://youtu.be/B-DpIhedGmk>
2. <https://youtu.be/GmN1hF5Sng0>
3. <https://youtu.be/C2mGEnQ1Y54>
4. <https://youtu.be/6BrsdhuImlg>
5. <https://youtu.be/B494VE1IVfo>
6. <https://youtu.be/EsxJDaEKlkw>
7. <https://youtu.be/lz7Xf5gKFcs>
8. [https://youtu.be/JY42FFz\\_zPs](https://youtu.be/JY42FFz_zPs)
9. <https://youtu.be/oAXMlsG9UQI>
10. <https://youtu.be/7Tlzzr9nBP8>
11. [https://youtu.be/\\_T36oYc7Oag](https://youtu.be/_T36oYc7Oag)
12. <https://youtu.be/hDT3klGQDzU>
13. <https://youtu.be/N06uXaIKDPQ>
14. <https://youtu.be/JoG4XZ-ItF4>

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**B. Sc. CHEMISTRY SYLLABUS - I YEAR - II SEMESTER (Distance Mode)**

**COURSE TITLE** : **ECONOMIC ZOOLOGY**

**COURSE CODE** : **BZOOSA-22**

**COURSE CREDIT** : **3**

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**COURSE OBJECTIVES (CO)**

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While studying the Economic Zoology course, the student shall be able to:

**CO1.** Import the knowledge about the basic concepts of insect vectors.

**CO2.** Learners are taught about fish culture,

**CO3.** Elaborate the freshwater fish culture, prawn culture, apiculture etc.,

**CO4.** Gain disease management of sericulture, fisheries, apiculture, poultry etc.,

**CO5.** Gain the knowledge about migrations of bird and fishes.

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**COURSE OUTCOMES (COC)**

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After completion of the Economic Zoology, the student will be able to:

**COC1.** Demonstrate the basic concepts of insect vectors.

**COC2.** Learners are taught about fish culture, prawn culture, apiculture etc.,

**COC3.** Gain knowledge about disease management of sericulture, fisheries, apiculture, poultry etc.

**COC4.** Explore various concepts and the importance of economic zoology.

**COC5.** Explain the freshwater fish culture.

**BLOCK I BENEFICIAL AND HARMFUL INSECTS**

Unit -1. Beneficial and harmful insects, including insect vectors of human diseases (Mosquito and Lice)

Unit -2. Pests of sugar cane (*Pyrrilla perpusilla*)

Unit -3. Pests of oil seeds (*Achaea janata*)

Unit -4. Pests of rice (*Sitophilus oryzae*)

**BLOCK II AQUACULTURE**

Unit -5. Aquaculture: Principles, definition and scope

Unit -6. Exotic fishes - their merits and demerits

Unit -7. Basic principles of different aquaculture system (Polyculture and integrated farming)

Unit -8. Culture of prawn

Unit -9. Pearl culture

### **BLOCK III APICULTURE**

Unit -10. Apiculture: Development of apiary in India

Unit -11. Types of honey bees

Unit -12. Modern methods of apiary management

Unit -13. Products and its uses

Unit -14. Problems and prospects

### **BLOCK IV SERICULTURE**

Unit -15. Sericulture: Life history and rearing of Bombyx mori, harvesting & processing of cocoon, reeling and extraction of silk

Unit -16. Diseases of silkworms of Bombyx mori and control measures

### **BLOCK V POULTRY FARMING**

Unit -17. Poultry: Fowl -Types of breeds

Unit -18. Rearing of Fowl

Unit -19. Disease management

### **TEXT BOOK**

1. Life and Diversity from Protozoa to Porifera and Cell Biology I Books.

### **REFERENCES:**

1. **AYYAR, E.K. & T.N. ANANTHAKRISHNAN** (2000), Manual of Zoology Vol. I & II (Non – Chordata and Chordata), S. Viswanathan (Printers and Publishers) Pvt. Ltd., Madras.

2. **SHUKLA & UPADHYAY** (2014) Economic Zoology, 5<sup>th</sup> Edition, Rastogi Publication, Meerut, New Delhi.

3. **KOTPAL, R.L** (2000), Modern Textbook of Zoology, Rastogi Publications (2000) Meerut, New Delhi.

### **WEB RESOURCES:**

1. <https://youtu.be/1nKlgXKvFhk>

2. [https://youtu.be/mZgr\\_GwfepE](https://youtu.be/mZgr_GwfepE)

3. <https://youtu.be/p55hpZUD7Hw>

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**B. Sc. CHEMISTRY PRACTICAL SYLLABUS - I YEAR  
(II SEMEMSTER)**

<b>COURSE TITLE</b>	<b>: VOLUMETRIC ANALYSIS</b>
<b>COURSE CODE</b>	<b>: BCHES-P1</b>
<b>COURSE CREDIT</b>	<b>: 4</b>

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**COURSE OBJECTIVES (CO)**

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While studying the Volumetric analysis practical course, the student will be able to:

- CO1.** Explain about the acidimetry and alkalimetry titrations in which how the given solutions are estimated
- CO2.** Describe the iodometry titrations in which how given compounds are estimated
- CO3.** Acquire knowledge on the permanganometry titration in which how given compounds and ions are estimated

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**COURSE OUTCOMES (COC)**

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After completion of the Volumetric analysis practical course, the student will be able to:

- COC1.** Describe the acidimetry and alkalimetry titrations in which how given solutions are estimated
- COC2.** Get awareness on the iodometry titrations in which how given compounds are estimated
- COC3.** Determine the permanganometry titration in which how given compounds and ions are estimated

**VOLUMETRIC ANALYSIS (BCHEP-01)**

A double titration involving the making up of the solution to be estimated and the preparation of a primary standard.

**1. ACIDIMETRY & ALKALIMETRY**

1. Estimation of NaOH
2. Estimation of Oxalic acid
3. Estimation of Na<sub>2</sub>CO<sub>3</sub>

**2. IODIMETRY**

1. Estimation of Copper
2. Estimation of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>

### 3. PERMANGANOMETRY

1. Estimation of Ferrous ion
2. Estimation of Oxalic acid

#### **Web Links:**

1. <https://youtu.be/iPYyRNjXkgY>
2. <https://youtu.be/7g-m-D8oe3s>
3. <https://youtu.be/xi9uEYEygMY>
4. <https://youtu.be/O8VjqbbI7a4>
5. <https://youtu.be/8mK9QASIYLM>
6. <https://youtu.be/AewfUririZk>
7. <https://youtu.be/m55bbYzvhjA>
8. <https://youtu.be/9pWGzAWYv2k>

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## B. Sc. CHEMISTRY SYLLABUS FOR II YEAR (III SEMESTER)

<b>COURSE TITLE</b>	<b>:</b>	<b>CHEMISTRY - III</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHES-31</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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### **COURSE OBJECTIVES (CO)**

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While studying the Chemistry - III course, the student will be able to:

- CO1.** Determine the characteristic features of s-block elements
- CO2.** Discuss the characteristic of Boron and Carbon families in the p-block elements
- CO3.** Interpret the characteristic features and types of substitution reactions
- CO4.** Describe the characteristic features of kinetics of the chemical reactions
- CO5.** Explain about the classification, synthesis and structures of Terpenoids and Alkaloids

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### **COURSE OUTCOMES (COC)**

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After completion of the General Chemistry - III course, the student will be able to:

- COC1.** Explain the characteristic features of the elements in s-block
- COC2.** Interpret the characteristic features of Boron and Carbon families in the p-block elements
- COC3.** Describe the characteristic features and types of substitution reactions
- COC4.** Discuss the characteristic features of kinetics of the chemical reactions
- COC5.** Define the classification, synthesis and structures of Terpenoids and Alkaloids.

#### **Block I: s-block elements**

**Unit-1-** General characteristic features of s-block elements - compounds of s-block metals oxides, hydroxides and peroxides - preparation and properties of carbonates, bicarbonates, nitrates and halides.

**Unit-2-** Anomalous behavior of Li and Be - extraction, physical, chemical properties and uses of beryllium - organometallic compounds of Li and Be.

**Unit-3-** Physical chemical properties and uses of Mg - biological importance of sodium and potassium.

#### **Block II: p-block elements (Boron and Carbon families)**

**Unit-4-** General characteristic features of p-block elements and elements of Group III A - Compounds of boron: Borax, Boric acid, Diborane and Boron nitride.

**Unit-5-** Extraction, chemical properties and uses of Aluminium - compounds of Aluminium -  $\text{Al}_2\text{O}_3$ ,  $\text{AlCl}_3$ , Alums - Alloys of Aluminium.

**Unit-6-** General characteristics features of elements of Group III A - Allotropic forms of carbon - chemistry of Charcoal - physical, chemical properties and uses of Si - structures of silicates-chemistry of silicones - types and manufacture of glass - ceramics.

### **Block III: Substitution reactions**

**Unit-7-** General characteristics of aromatic electrophilic substitution reaction - Characteristics of ortho, meta and para directing groups with examples - Synthetic application of nitration, sulphonation, and halogenation.

**Unit-8-** Friedal's Craft's alkylation and arylation - Riemer-Tiemann reaction - Gattermann-Koch reaction - Vilsmeier Haack reaction.

**Unit-9-** General characteristics of Aromatic nucleophilic substitution reaction - substitution involving diazonium ions - Ziegler alkylation - Chichibabin reaction.

### **Block IV: Reaction Kinetics**

**Unit-10-** Definition for Order and Molecularity - methods to determine the rate of reactions - Derivation of rate constants for I, II, III and Zero order reactions and examples - Methods to determine the order of reactions - effect of temperature on the rate of reactions.

**Unit-11-** Arrhenius equation and concept of energy of activation - Collision theory and derivation of rate constant for bimolecular reactions - theory of absolute reaction rates.

**Unit-12-** Thermodynamic derivation for the rate constant for a bimolecular reaction - comparison of collision theory and ARRT - Significance of entropy and free energy of activation.

### **Block V: Terpenoids and Alkaloids**

**Unit-13-** Introduction and classification of terpenes and terpenoids - isoprene rule - Synthesis and structural elucidation of citral, limonene, menthol,  $\alpha$ -terpineol and camphor

**Unit-14-** Introduction and classification of alkaloids - General methods for the determination of structure of alkaloids - Synthesis and structural elucidation of conine, piperine and nicotine.

### **Text books:**

1. Advanced Inorganic Chemistry by S.P.Banerjee, Volume I & II.
2. A text-book of Pharmaceutical Chemistry & Medicinal Chemistry by Raghupati Mukhopadhyay, Sriparna Datta and Rajib Kumar Das.
3. Advanced Organic Chemistry by B.S. Bahl, ArunBahl and S.Chand.
4. Principles of Inorganic Chemistry by B.R. Puri, L.R. Sharma and ShobanlalNagin Chand.
5. A text book of Physical Chemistry by P.L.Soni, D.B. Dharmarke and Sultan Chand.
6. Inorganic Chemistry by P.L.Soni and Sultan Chand.

7. Organic Chemistry by S.M. Mughgergee, S.P. Singh, R.P. Kapoor and Wiley Eastern Volume. I, II & III.
8. Essentials of Physical Chemistry by B.S. Bahl, G.D. Tuli, and S.Chand.

### **Reference Books**

1. Inorganic Chemistry, J.E. Huheey, Harper and Collins, NY, IV Edition, (2010).
2. Concise Inorganic Chemistry, J. D. Lee, Wiley; Fifth Edition edition (2016).
3. Organic Chemistry, R. T. Morrison, R. N. Boyd, Prentice Hall; 6th edition (1992).
4. Pearson House, Fundamentals of Chemical Kinetics ,Createspace Independent Pub; 1st edition (2017).
5. K.J. Laidler, Chemical Kinetics, Pearson; 3 edition (1997).
6. Organic Chemistry Vol 2, I. L. Finar, Pearson.

### **Web Linkss**

1. <https://youtu.be/kEQ8z9UFNa0>
2. <https://youtu.be/MiW4-XtEhMs>
3. <https://youtu.be/qC-2dOP2FTg>
4. <https://youtu.be/EijNYsp9s8k>
5. <https://youtu.be/tsWQYMnBKl0>
6. <https://youtu.be/0hcRLZfh5UE>
7. <https://youtu.be/I8qsSgUDZZk>
8. <https://youtu.be/yKccrM-Ayr8>
9. <https://youtu.be/bEEnD7LFHF0>
10. <https://youtu.be/g7jmTgqOVZ8>
11. <https://youtu.be/jX4dEOFwaLQ>
12. <https://youtu.be/jX4dEOFwaLQ>
13. <https://youtu.be/l2LymcI096Q>
14. <https://youtu.be/hm9w-HRDW2Y>

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**B. Sc. CHEMISTRY SYLLABUS - II YEAR - III SEMESTER (Distance Mode)**

**COURSE TITLE** : **ALLIED PHYSICS - I**

**COURSE CODE** : **BPHYSA - 11**

**COURSE CREDIT** : **3**

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**COURSE OBJECTIVES (CO)**

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While studying the Allied Physics-I, the Learner shall be able to:

**CO1.** To learn the basic concepts of physics

**CO2.** To understand the fundamentals of Waves, Properties of matter, Heat, Electricity and Magnetism.

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**COURSE OUTCOMES (COC)**

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After completion of the Allied Physics-I, the Learner will be able to:

**COC1.** Demonstrate conceptual understanding of the fundamental Physics principles.

Identify various properties responsible for their behavior

**COC2.** Understand the concept of elasticity and identify the materials suitable for a particular application

**COC3.** Apply the basic laws of mechanics to understand the working of simple machines.

**COC4.** Appreciate the usage of the basic concepts of Physics in everyday life

**BLOCK I: Waves and Oscillations**

Simple harmonic motion – composition of two simple harmonic motion at right angles (periods in the ratio 1:1) – Lissajou’s figures – uses. laws of transverse vibrations of strings – Melde’s string – transverse and longitudinal modes -Sonometer-determination of a.c frequency using sonometer (steel and brass wires). Ultrasonics – production – application and uses – reverberation – factors for good acoustics of hall and auditorium.

**BLOCK II: Properties of matter**

Elasticity: Elastic constants – bending of beam – Young’s modulus by non- uniform bending.

Energy stored in a stretched wire – torsion in a wire – determination of rigidity modulus by torsional pendulum – static torsion. Viscosity: Coefficient of viscosity – Poissuelle’s formula – comparison of viscosities - burette method – Stoke’s law – terminal velocity – viscosity of highly viscous liquid – lubrication. Surface tension: Molecular theory of surface tension – excess of pressure inside a drop and bubble – variation of surface tension with temperature – Jaeger’s method.

### **BLOCK III : Thermal Physics**

Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory and application. - liquefaction of gasses – Linde’s process – Helium I and II – adiabatic demagnetization. Thermodynamic equilibrium – laws of thermodynamics – entropy change of entropy in reversible and irreversible processes.

### **BLOCK IV: Electricity and Magnetism**

Capacitor – energy of a charged capacitor - loss of energy due to sharing of charges – Magnetic field due to a current carrying conductor – Biot Savart’s Law – Field along the axis of the coil carrying current. AC current: peak, average and RMS values of ac current and voltage – power factor and current values in an ac circuit. Circuit control and protective devices -switch and its types – fuses circuit breaker and relays.

### **BLOCK V: Geometrical optics**

Refraction – Refractive index by microscopy – air cell – refraction at grazing incidence and grazing emergence in prisms – Dispersion-combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion – direct vision prism – constant deviation prism – defects of images – coma – distortion. Lens: spherical and chromatic aberration in lenses.

#### **Text Books:**

1. Allied Physics by R. Murugesan, S.Chand & Co, New Delhi(2008).  
Waves and Oscillations by Brijlal and N. Subramanyam, Vikas Publishing house, New Delhi.
2. Properties of Matter by Brij Lal and N.Subramaniam, S. Chand & Co., New Delhi(1994).
2. Heat and Thermodynamics by J.B.Rajam and C.L.Arora, S.Chand & Co., 8<sup>th</sup> edition, New Delhi(1976).
3. Optics and Spectroscopy by R. Murugesan, S.Chand & Co, New Delhi, (2005).

#### **Reference Books:**

1. Fundamentals of Physics by Resnick Halliday and Walker, John Willey and Sons, Asia Pvt.Ltd., 6<sup>th</sup> edition, Singapore.
2. Text book of Sound by V.R.Khanna and R.S.Bedi, Kedharnaath Publish & Co, 1<sup>st</sup> edition, Meerut (1998).

3. Electricity and Magnetism by N.S. Khare and S.S. Srivastava, Atma Ram & Sons, 10<sup>th</sup> Edition, New Delhi (1983).

**Web Resources:**

1. <https://youtu.be/-tcWmw2Ktok>
2. <https://youtu.be/DTX0KLHpRFc>
3. <https://youtu.be/6GV0WFJqe7c>
4. <https://youtu.be/2TOU50Wz4o8>

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## **B. Sc. CHEMISTRY SYLLABUS - II YEAR (IV SEMEMSTER)**

**COURSE TITLE : CHEMISTRY - IV**

**COURSE CODE : BCHES-41**

**COURSE CREDIT : 4**

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### **COURSE OBJECTIVES (CO)**

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While studying the Chemistry - IV course, the student will be able to:

**CO1.** Describe the principles, operations and processes involved in metallurgy

**CO2.** Explain about the principles and concepts involved in Green chemistry

**CO3.** Interpret the p-block elements of nitrogen, oxygen, halogen and noble gas families

**CO4.** Discuss the characteristic features of d and f-block elements

**CO5.** Determine the occurrence, classification and importance of biochemicals such as carbohydrates, vitamins, hormones, antiseptics, disinfectants, antimalarial, antibiotic analgesics, anaesthetics, antipyretics and anti-inflammatory.

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### **COURSE OUTCOMES (COC)**

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After completion of the Chemistry - IV course, the student will be able to:

**COC1.** Interpret the principles, operations and processes involved in metallurgy

**COC2.** Acquire knowledge on the principles and concepts involved in Green chemistry

**COC3.** Explain the p-block elements of nitrogen, oxygen, halogen and noble gas families

**COC4.** Determine the characteristic features of d and f-block elements

**COC5.** Describe the occurrence, classification and importance of biochemicals such as carbohydrates, vitamins, hormones, antiseptics, disinfectants, antimalarial, antibiotic analgesics, anaesthetics, antipyretics and anti-inflammatory.

### **Block I: Metallurgy**

**Unit-1-** Principles, operations and processes involved in metallurgy - General methods involved in extraction of metals - froth floatation, magnetic separation, calcinations, roasting, smelting, flux, and aluminothermic process.

**Unit-2-** Extraction processes - chemical reduction, electrolytic reduction and metal displacement.

**Unit-3-** Refining methods - electrolytic refining and zone refining - Distillation, fractional crystallization, electrolysis, van Arkel de Boer methods, ion exchange method and muffle furnace.

## **Block II: Green Chemistry**

**Unit-4-** Definition, need and principles of Green chemistry - Green synthesis: Aqueous phase reactions, reactions in ionic liquids, solid supported synthesis and solvent free reactions.

**Unit-5-** Definition and properties of Green catalysts - Phase transfer catalysts (PTC) and Biocatalysts - Microwave and Ultrasound assisted green synthesis - Green chemical synthesis of paracetamol.

## **Block III: p-block elements (Nitrogen, Oxygen, Halogen and Noble gas families)**

**Unit-6-** General characteristic features of elements of VA Group - Preparation, physical, chemical properties and uses of Nitrogen and Oxygen - Chemistry of  $\text{PH}_3$ ,  $\text{PCl}_3$ ,  $\text{PCl}_5$ ,  $\text{POCl}_3$  and  $\text{P}_2\text{O}_5$ . - Anomalous behavior of oxygen - chemistry of Selenium and Tellurium.

**Unit-7-** General characteristics of Halogen family - with reference of electro negativity, electron affinity, and oxidation states - Inter-halogen and pseudohalogen compounds.

**Unit-8-** General characteristics of Noble gases - position in the periodic table and uses of Noble gases - Structure and shape of xenon compounds:  $\text{XeF}_2$ ,  $\text{XeF}_4$ ,  $\text{XeF}_6$ ,  $\text{XeOF}_2$  and  $\text{XeOF}_4$ .

## **Block IV: d and f-block elements**

**Unit-9-** General characteristics, electronic configuration and uses of d-block elements - group study of titanium, vanadium, chromium, manganese and iron metals - Oxides, halides, sulphides and oxohalides of transition metals - toxicity of Cd and Hg.

**Unit-10-** General characteristics and classifications of f-block elements - Electronic configuration, oxidation states, uses and comparative account of lanthanides and actinides - lanthanide contraction

## **Block V: Biomolecules**

**Unit-11-** Carbohydrates: Monosaccharides, Disaccharides and Polysaccharides - classification, preparation, properties and structures.

**Unit-12 -** Vitamins: occurrence, classification and structure - Deficiency diseases caused by Vitamin A, B complex, C, D, E and K.

**Unit-13 -** Introduction to Hormones - reproductive hormones - Definition to Anti-malarial - classification and use of chloroquine and Pamaquine.

**Unit-14-** Definition to Antiseptics and Disinfectants: uses of chloramine-T, Iodoform and Dettol - Definition to Antibiotics: uses of Penicillin, Chloromycetin, Streptomycin and Tetracycline - Definitions and examples for analgesics, anaesthetics, antipyretics and antiinflammatory.

### **Text Books:**

1. Environmental Chemistry with Green Chemistry by Asim K. Das.
2. A text book of Inorganic Chemistry by A.K. De and Wiley.
3. Concise Inorganic Chemistry by J.D. Lee.
4. Biochemistry by SC Rastogi, Edition II.
6. Inorganic Chemistry by Shriver and Atkins.
7. Green Chemistry (Environment Friendly Alternatives) by Rashmi Sanghi and M.M. Srivastava.

### **Reference Books:**

1. Inorganic Chemistry, J.E. Huheey, Harper and Collins, NY, IV Edition, (2010).
2. Concise Inorganic Chemistry, J. D. Lee, Wiley; Fifth Edition edition (2016).
3. Green Chemistry: Theory and Practice, Paul T. Anastas, John Charles Warner, Oxford University Press, (2000).
4. Organic Chemistry, R. T. Morrison, R. N. Boyd, Prentice Hall; 6th edition (1992).
5. Organic Chemistry Vol 2, I. L. Finar, Pearson.

### **Web Links:**

1. [https://youtu.be/QalAQq\\_-Z14](https://youtu.be/QalAQq_-Z14)
2. <https://youtu.be/zMLNHm4nUCQ>
3. [https://youtu.be/ViM\\_aP5BKzc](https://youtu.be/ViM_aP5BKzc)
4. <https://youtu.be/3QaY7pf-EDo>
5. <https://youtu.be/S4iwxPyVvxM>
6. <https://youtu.be/w0e3Ogusxg0>
7. <https://youtu.be/43nFNTHV5iE>
8. [https://youtu.be/fy1CTaNkf\\_Q](https://youtu.be/fy1CTaNkf_Q)
9. <https://youtu.be/uqcrNiif-S0>
10. <https://youtu.be/kEQ8z9UFNa0>
11. [https://youtu.be/7IVm\\_oEPJw4](https://youtu.be/7IVm_oEPJw4)
12. <https://youtu.be/dtCvYfhzPQ0>
13. <https://youtu.be/q1iNVvBIT6g>
14. <https://youtu.be/XYDaMySWIbA>

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## **B. Sc. CHEMISTRY SYLLABUS - II YEAR - IV SEMESTER (Distance Mode)**

**COURSE TITLE** : **ALLIED PHYSICS - II**  
**COURSE CODE** : **BPHYSA-22**  
**COURSE CREDIT** : **3**

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### **COURSE OBJECTIVES (CO)**

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While studying the Allied Physics-II, the Learner shall be able to:

**CO1.** To learn the basic concepts of physics

**CO2.** To understand the fundamentals of Optics, Atomic and Nuclear Physics and Electronics.

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### **COURSE OUTCOMES (COC)**

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After completion of the Allied Physics-II,, the Learner will be able to:

**COC1.** Understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to daylife.

**COC2.** Will be able to understand the working of analog and digital circuits.

**COC3.** To understand the basic principles of logic gates

**COC4.** Appreciate the usage of the basic concepts of Physics in everyday life

### **BLOCK I: Physical Optics**

Velocity of light – Michelson’s method. Interference :Colours of thin films –air wedge – determination of diameter of a thin wire by air wedge – test for optical flatness – Diffraction – Fresnel’s explanation of rectilinear propagation of light – theory of transmission grating – Normal incidence. Polarization – double refraction - optical activity – polarimeter.

### **BLOCK II: Atomic Physics**

Atom model – vector atom model – electron, spin, quantum numbers – Pauli’s exclusion principle – Electronic configuration of elements and periodic classification of elements – various quantum numbers –Magnetic dipole moment of electron due to orbital and spin motion – Bohr magneton – spatial quantisation – Stern and Gerlach experiment.

### **BLOCK III: Nuclear Physics**

Nuclear model – liquid drop model – magic numbers - shell model –Nuclear energy – mass defect – binding energy. Radiation detectors – ionization chambers – GM Counter – Fission

Controlled and Uncontrolled chain reaction – nuclear reactor – Thermonuclear reactions – stellar energy.

#### **BLOCK IV: Elements of relativity and quantum mechanics**

Postulates of theory of relativity – Lorentz transformation equations – derivation – length contraction – Time dilation – Mass energy equivalence – uncertainty principle – Postulates of wave mechanics – Schrodinger's equation – application to a particle in a box.

#### **BLOCK V: Electronics**

Basic Electronics: Zener diode – voltage regulator – LED – Transistor RC coupled amplifier – feedback principle – condition for oscillation – phase shift oscillator – Wein's bridge oscillator. Digital Electronics: NAND and NOR gates – Universal building blocks. Boolean algebra – Demorgan's theorem – verification – elementary ideas of ICs – SSI, MSI, LSI and VLSI – Half adder, Full adder, Half Subtractor and Full subtractor.

#### **Text Books:**

1. Allied Physics by R. Murugesan, S.Chand & Co, New Delhi(2008).
2. Allied Physics by K. Thangaraj and D. Jayaraman, Popular Book Depot, Chennai(2004).
3. Text book of Optics by Brijlal and N. Subramanyam, S.Chand & Co, New Delhi(2002).
4. Modern Physics by R. Murugesan, S.Chand & Co, New Delhi (2005).
5. Applied Electronics by A. Subramaniam, National Publishing Co., 2<sup>nd</sup> Edition, Chennai(2001).

#### **Reference Books:**

1. Fundamentals of Physics by Resnick Halliday and Walker, John Willey and Sons, Asia Pvt.Ltd., 6<sup>th</sup> Edition, Singapore.
2. Optics by D.R. Khanna and H.R. Gulati, S. Chand & Co., New Delhi (1979).
3. Concepts of Modern Physics by A.Beiser, Tata McGraw Hill Publication, New Delhi(1997).
4. Digital Fundamentals by Thomas L.Floyd, Universal Book Stall – New Delhi (1998).

#### **Web Resources:**

1. <https://youtu.be/6faTdUxafnw>
2. <https://youtu.be/DVQkHVwAvhs>
3. <https://youtu.be/4q1i7yTcQmA>

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## B.Sc. CHEMISTRY PRACTICAL SYLLABUS - II YEAR

### (IV SEMESTER)

**COURSE TITLE : INORGANIC SEMI-MICRO  
QUALITATIVE ANALYSIS**

**COURSE CODE : BCHES-P2**

**COURSE CREDIT : 4**

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#### **COURSE OBJECTIVES (CO)**

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While studying the Inorganic semi-micro qualitative analysis practical course, the student will be able to:

**CO1.** Explain the basic terms and concepts involved in the semi-micro qualitative analysis method

**CO2.** Describe the analysis of a mixture containing two cations and two anions by semi-micro qualitative analysis method

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#### **COURSE OUTCOMES (COC)**

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After completion of the Inorganic semi-micro qualitative analysis course, the student will be to:

**COC1.** Acquire knowledge on the basic terms and concepts involved in the semi-micro qualitative analysis method

**COC1.** Analyze a mixture containing two cations and two anions by semi-micro qualitative analysis method

#### **Practical-II: INORGANIC SEMI-MICRO QUALITATIVE ANALYSIS**

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations to be analyzed: Copper, Nickel, Cobalt, Zinc, Lead, Bismuth, Cadmium, Iron, Aluminum, Manganese, Barium, Calcium, Strontium, Magnesium and Ammonium.

Anions to be analyzed: Fluoride, Chloride, Bromide, Carbonate, Nitrate, Sulphate, Oxalate and Phosphate.

**Web Links:**

1. <https://youtu.be/6mfRpKRUjIQ>
2. <https://youtu.be/sjwbit-ecDw>
3. <https://youtu.be/zMZAdiYdXGo>

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**B. Sc. CHEMISTRY SYLLABUS - II YEAR - IV SEMESTER (Distance Mode)**

**COURSE TITLE : ENVIRONMENTAL SCIENCE**

**COURSE CODE : CCE**

**COURSE CREDIT : 2**

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**COURSE OBJECTIVES (CO)**

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While studying the Environmental Science course, the Learner shall be able to:

**CO1.** To help students to gain the fundamental knowledge of the environment

**CO2.** To create in students an awareness of current environmental issues

**CO3.** To inculcate in students an eco-sensitive, eco-conscious and eco-friendly attitude.

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**COURSE OUTCOMES (COC)**

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After completion of the Environmental Science course, the Learner will be able to:

**COC1.** Articulate the interdisciplinary context of environmental issues

**COC2.** Adopt sustainable alternatives that integrate science, humanities and social perspectives

**COC3.** Appreciate the importance of biodiversity and a balanced ecosystem

Calculate one's carbon print

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**Unit 1: Multidisciplinary nature of environmental studies:** Definition, scope and importance -  
Need for public awareness

**Unit 2: Natural Resources:**

Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

- Equitable use of resources for sustainable lifestyles.

### **Unit 3: Ecosystems:**

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem: -  
a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (6 lectures)

### **Unit 4: Biodiversity and its conservation:**

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. (8 lectures)

### **Unit 5 : Environmental Pollution:**

- Definition
- Cause, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
  - Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

### **Unit 6: Social Issues and the Environment:**

- From Unsustainable to Sustainable development
- Urban problems related to energy

- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust- Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

#### **Unit 7: Human Population and the Environment:**

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

#### **Unit: 8 Field Work Visit:**

Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

#### **Text Books:**

1. Rosencranz., A..Divan,S..& Noble, M.L.2001.Environmental law and policy in India, Tirupathi 1992.
2. Sengupta,R.2003.Ecology and Economics: An approach to sustainable development.OUP
3. Singh.J.S..Singh..S.P and Gupta,,S.R.2014.Ecology E nvironmental Science and Conservation, S.ChandPublishing .New Delhi .
4. Sodhi,N.S..Gibson.I..&Raven,P.H(EDS).2013.Conservation Biology :Voices from

the Tropics. John Willey & Sons.

5. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
6. Ware, C.E. 1971. Biology and water Pollution Control. WB Saunders.
7. Wilson, E.O. 2006. The Creation: An appeal to save life on earth. New York: Norton.

### **Reference Books:**

1. Carson, R. 2002. Silent Spring, Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India, Univ. Of California Press.
3. Gleeson, B. And Law, N. (eds.) 1999, Global Ethics and Environment, London, Routledge.
4. Glieck, P.H. 1993. Water Crisis, Pacific Institute for Studies in Dev. Environment & Security, Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll, Principles of Conservation Biology. Sunderland: Sinauer Associate, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalayas dams. Science, 339:36-37
7. McCully, P. 1996. Rivers no more : the environmental effects of dams (pp.29.64). Zed books.
8. McNeill John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrees, J. 1971. Fundamentals of Ecology, Philadelphia Saunders.
10. Pepper, J.J., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment, Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Willey & sons.

### **Web Resources:**

1. <https://youtu.be/b4KRaxE5PtI>
2. <https://youtu.be/OT5FxxSLxTg>
3. [https://youtu.be/KQF9WdZrH\\_c](https://youtu.be/KQF9WdZrH_c)
4. <https://youtu.be/V4wBFtAbBf8>
5. <https://youtu.be/oSbUp3XYQX8>
6. <https://youtu.be/WxFSBZYYPzE>

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## **B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (V SEMESTER)**

<b>COURSE TITLE</b>	<b>:</b>	<b>INORGANIC CHEMISTRY - I</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHES-51</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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### **COURSE OBJECTIVES (CO)**

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While studying the Inorganic Chemistry-I course, the student will be able to:

- CO1.** Describe the characteristics and concepts involved in solid state chemistry
- CO2.** Interpret about the theories and concepts involved in coordination chemistry
- CO3.** Get awareness on the characteristics and concepts involved in nuclear chemistry
- CO4.** Determine the theories and applications of protic and aprotic solvents
- CO5.** Explain about the characteristic features of organometallic compounds

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### **COURSE OUTCOMES (COC)**

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After completion of the Inorganic Chemistry-I course, the student will be able to:

- COC1.** Acquire knowledge on the characteristics and concepts involved in solid state chemistry
- COC2.** Discuss the theories and concepts involved in coordination chemistry
- COC3.** Explain about the characteristics and concepts involved in nuclear chemistry
- COC4.** Get awareness on the theories and applications of protic and aprotic solvents
- COC5.** Describe the characteristic features of organometallic compounds

### **Block I: Solid state Chemistry-I**

**Unit-1-** Structure of solids - classification of solids - amorphous and crystalline solids - Van der waals crystals - covalent crystals.

**Unit-2-** Laws of crystallography Elements of symmetry - Weiss and Miller indices - crystal systems and Bravais lattices - structure of ionic solids.

**Unit-3-** Crystal defects - Schottky and Frenkel defects - F-center.

## **Block II: Coordination Chemistry-I**

**Unit-4-** Definition, nomenclature and terms involved in coordination chemistry.

**Unit-5-** Werner's and VB coordination theory - EAN rule.

**Unit-6-** Isomerism: Examples of Geometrical and optical isomerism in square planar and octahedral coordination compounds.

## **Block III: Nuclear Chemistry - I**

**Unit-7-** Introduction to Nuclear Chemistry - composition of nucleus and nuclear forces - nuclear stability - mass defect - binding energy - packing fraction - N/P ratio.

**Unit-8-** Magic numbers - nuclear models - liquid drop - Shell and collective model - Isotopes - isobars - isotones - isomers.

**Unit-9-** Radioactive decay and modes of radioactive decay - threshold energy - cross sections.

## **Block IV: Protic and Aprotic Solvents**

**Unit-10-** Definition and examples for protic and aprotic solvents - classification of solvents - general properties of ionizing solvents.

**Unit-11-** Chemical reactions with solvents such as Water, liquid  $\text{NH}_3$ , liq.  $\text{N}_2\text{O}_4$ , liq.  $\text{H}_2\text{S}$ , and liq.  $\text{HF}$ .

## **Block V: Organometallic compounds - I**

**Unit-12-** Introduction to Organometallic compounds -16 and 18- electron rule.

**Unit-13-** Preparation, physical, chemical properties and uses organomagnesium, organolithium and organoboron compounds.

**Unit-14-** M-M bonding and cluster compounds - synthesis and reactivity of vanadates, chromates, molybdates, tungstates, manganite and permanganate.

### **Text Books:**

1. Principles of Inorganic Chemistry by B.R. Puri, L.R. Sharma, Shobanlal Nagin Chand Co. (1990).
2. Inorganic chemistry by P.L. Soni, Sultan Chand Co. (1990).
3. Advanced Inorganic Chemistry I Sathya Prakash, G. D. Tuli, S. K. Basu, R. D. Madhan, S. Chand Publishing.

4. Wahid U. Malik, G. D. Tuli, R. D. Madhan, Selected Topics in Inorganic Chemistry S. Chand Publishing.
5. J.E. Huheey, Inorganic Chemistry, Harper and Collins, NY, IV Edition, (1993).
6. J. D. Lee, Inorganic Chemistry, Oxford University Press; Fifth edition (2008).
7. Ashuthosh Kar, Advanced Inorganic Chemistry, CBS Publications, (2010).
8. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Milestone Publishers & Distributors/ Vishal Publishing Co.; 33rd edition edition (2017).

### **Reference Books:**

1. Concepts of Inorganic Chemistry by F.A. Cotton Wiley; 6th edition (1999).
2. Inorganic Reaction Mechanism – Edberg, Academic Press, (2017).
3. Inorganic Reaction Mechanism – Basolo and Pearson, John Wiley & Sons Inc; 2nd Revised edition (1967).
4. Reaction Mechanism in Inorganic Chemistry by R. R. Jordan Oxford Univ. Press,. 2nd edition (1998).
5. Solid State Chemistry and Its Applications; 2nd Ed., John Wiley and sons, New York, (2014).

### **Web Links:**

1. <https://youtu.be/i2gSLFCx65c>
2. <https://youtu.be/bccBP8C03A0>
3. <https://youtu.be/ktXK2yPdwks>
4. <https://youtu.be/8H9HcO11tUU>
5. [https://youtu.be/1SpTbmN0\\_w](https://youtu.be/1SpTbmN0_w)
6. <https://youtu.be/NaQuq9GhkGc>
7. <https://youtu.be/T7Y17MEfu8I>
8. [https://youtu.be/IYe\\_vWk0GN0](https://youtu.be/IYe_vWk0GN0)
9. <https://youtu.be/R0tdsaFJ4vg>
10. <https://youtu.be/w7yVVLSQ9CU>
11. [https://youtu.be/TLy\\_1x9tub4](https://youtu.be/TLy_1x9tub4)
12. <https://youtu.be/3Eml2U863ws>
13. <https://youtu.be/3FRV31YYtL8>
14. <https://youtu.be/3PmB20gPMOo>

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## **B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (V SEMESTER)**

<b>COURSE TITLE</b>	<b>:</b>	<b>ORGANIC CHEMISTRY - I</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHES-52</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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### **COURSE OBJECTIVES (CO)**

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While studying the Organic Chemistry - I course, the student will be able to:

- CO1.** Explain about the chemistry of heterocyclic compounds
- CO2.** Discuss the concepts involved in the chirality of organic molecules
- CO3.** Determine the optical activity and conformational analysis of organic molecules
- CO4.** Interpret the molecular rearrangement reactions and its types
- CO5.** Acquire knowledge about the principles and applications of IR and NMR spectroscopy.

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### **COURSE OUTCOMES (COC)**

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After completion of the Organic Chemistry - I course, the student will be able to:

- COC1.** Acquire knowledge on the chemistry of heterocyclic compounds
- COC2.** Explain about the concepts involved in the chirality of organic molecules
- COC3.** Describe the optical activity and conformational analysis of organic molecules
- COC4.** Gain knowledge on the molecular rearrangement reactions and its types
- COC5.** Discuss about the principles and applications of IR and NMR spectroscopy.

### **Block I: Chemistry of Heterocycles**

**Unit-1-** Chemistry of Furan, Pyrrole, Thiophene, Pyridine, Indole, Quinoline and Isoquinoline.

**Unit-2-** Fisher indole synthesis - Skraup and Bischler - Nepieralski synthesis.

### **Block II: Chirality - I**

**Unit-3-** Introduction to chirality - asymmetric molecules and molecular dissymmetry - pseudo asymmetry.

**Unit-4-** Optical rotation specific rotation - optical purity – racemization.

**Unit-5-** Representation of molecules in Saw horse, Fischer, Flying-wedge and Newman formulae and their inter translations.

### **Block III: Optical activity - I**

**Unit-6-** Introduction to optical activity - Optical activity of biphenyls, allenes and spiranes - stereo selectivity and specificity - Nomenclature of geometrical isomers - cis, trans, E-Z notation and Syn.

**Unit-7-** Conformation: conformational nomenclature - eclipsed, staggered, gauche and anti; dihedral angle, torsion angle, energy barrier of rotation.

### **Block IV: Molecular rearrangement reactions**

**Unit-8-** Introduction to molecular rearrangement reaction - inter, intra molecular rearrangements.

**Unit-9-** Rearrangement to electron deficient carbon - 1,2 shift (Wagner-Meerwein, Pinacol-Pinacolone and benzil-benzilic acid rearrangements)

**Unit-10-** Rearrangements from oxygen to ring carbon (Fries, Claisen and benzidine rearrangements).

**Unit-11-** Rearrangements to electron-deficient nitrogen (Beckmann, Lossen and Schmidt rearrangements).

### **Block V: IR and NMR Spectroscopy**

**Unit-12-** Introduction and principles of IR Spectroscopy - molecular vibrations - Finger-print region - applications of IR spectroscopy - interpretation of IR spectra in the simple molecules.

**Unit-13-** Introduction and principles of NMR Spectroscopy - spinning of proton in a magnetic field - position of signals and chemical shift - factors affecting chemical shift.

**Unit-14-** Number of peaks in the NMR spectra - equivalent and non-equivalent protons- peak area and proton counting- splitting of signals - interpretation of the NMR spectrum of simple compounds like methanol, ethanol, acetaldehyde.

### **Text Books:**

1. A text book of Organic Chemistry by ArunBhal, B. S. Bhal, and S.Chand.
2. Stereochemistry, Conformation and Mechanism by P.S. Kalsi, New Academic Science, (2020).

3. Organic Chemistry by I. L. Finar, and ELBS Longman, Volume I, 5<sup>th</sup> edition.
4. Organic Chemistry by Anupa Saha and Anup Pathak, Volume I & II, Books & Allied Ltd (2013).
5. Advanced Organic Chemistry (Organic Synthesis, Heterocycles & Biomolecules) by N. Tewari, Books & Allied Ltd (2013).
6. Reactions, Rearrangements and Reagents by S.N. Sanyal, Bharati Bhawan Publishers & Distributors; Fourth edition (2019).

### **Reference Books:**

1. Organic chemistry by P.H. Pine, McGraw-Hill Inc. US; 5th revised edition (1987).
2. Spectroscopic methods in organic chemistry by Williamms and Fleming, 5th edition (2009).
3. Stereochemistry of Organic Compounds, by Ernest L. Eliel, Samuel H. Wilen, Wiley; 1st edition (2008).
4. Organic Spectroscopy, W. Kemp, Macmillan; 2nd edition (2019).
5. NMR in Chemistry, W. Kemp, Springer, Macmillan Publishers Limited, (1986).

### **Web Links:**

1. <https://youtu.be/yc1m-qQVNEw>
2. <https://youtu.be/rlCqSVrS1Zg>
3. <https://youtu.be/rgBmFXeH1Ro>
4. [https://youtu.be/duGxp\\_XZzvw](https://youtu.be/duGxp_XZzvw)
5. <https://youtu.be/GJHSL9CwmEU>
6. <https://youtu.be/SHmoLzMY37c>
7. <https://youtu.be/xpJLSx3f6ug>
8. [https://youtu.be/fYJ05Xe\\_DVQ](https://youtu.be/fYJ05Xe_DVQ)
9. <https://youtu.be/fv9h29ZChfI>
10. <https://youtu.be/LFSJ-K-kNMk>
11. [https://youtu.be/sqKrvBOOC\\_c](https://youtu.be/sqKrvBOOC_c)
12. <https://youtu.be/XTE-SG8AjgU>
13. <https://youtu.be/RqBAW-uFHK0>
14. <https://youtu.be/pH7oOiQ0GR0>

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## B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (V SEMESTER)

<b>COURSE TITLE</b>	<b>:</b>	<b>PHYSICAL CHEMISTRY - I</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHE5-53</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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### COURSE OBJECTIVES(CO)

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While studying the Physical Chemistry-I course, the student will be able to:

- CO1.** Describe the laws and terms involved in thermodynamics
- CO2.** Explain about the characteristics of solution
- CO3.** Discuss the terms and applications of electrochemistry
- CO4.** Interpret the characteristics and applications of colloids
- CO5.** Acquire knowledge on the principles and applications of molecular spectroscopy

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### COURSE OUTCOMES (COC)

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After completion of the Physical Chemistry-I course, the student will be able to:

- COC1.** Discuss the laws and terms involved in thermodynamics
- COC2.** Determine the characteristics of solution
- COC3.** Explain the terms and applications of electrochemistry
- COC4.** Acquire knowledge on the characteristics and applications of colloids
- COC5.** Gain knowledge on the principles and applications of molecular spectroscopy

### Block I: Thermodynamics - I

**Unit-1-** Introduction to thermodynamics - intensive and extensive properties - types of systems - thermodynamic process - cyclic, reversible, irreversible, isothermal and adiabatic. **Unit-2-** Zeroth law of thermodynamic - concept of heat and work - First law of thermodynamics.

**Unit-3-** Internal energy - enthalpy - Joule's Law - Joule - Thompson effect.

## **Block II: Solution**

**Unit-4-** Introduction to ideal and non-ideal solutions - Raoult's law, Henry's law - Nernst distribution law - thermodynamics of ideal solutions.

**Unit-5-** Colligative properties: lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmotic pressure.

## **Block III: Electrochemistry-I**

**Unit-6-** Introduction to electrochemical cells - cell diagram and terminology - cell e.m.f. - electrode potential - standard e.m.f. of the cell

**Unit-7-** Nernst equation - single electrode potentials and cell e.m.f. measurement of single electrode potential.

**Unit-8-** Types of electrodes - reference electrodes - standard electrode potential - electrochemical series.

## **Block IV: Colloids**

**Unit-9-** Introduction to lyophobic and lyophilic colloids - origin of charge and stability of lyophobic and lyophobic colloids.

**Unit-10-** Coagulation and Schultz-Hardy rule - Zeta potential and Stern double layer (qualitative idea) - Tyndall effect - Self Assembly - Self Assembled Monolayers (SAM)

**Unit-11-** Application of colloids.

## **Block V: Molecular Spectroscopy -I**

**Unit-12-** Introduction to molecular spectroscopy- electromagnetic radiation and different regions.

**Unit-13 -** Introduction to absorption spectroscopy - molecular spectra - types of molecular spectra.

**Unit-14-** Introduction to rotational spectra - selection rule - spectra of diatomic molecules - rigid rotator - determination of moment of inertia and bond length.

## **Text Books:**

1. Physical Chemistry by Amrita Lal De and Abhranil De, Volume I, Narosa Publishing, (2009).
2. A text book of Physical Chemistry by P.L. Soni, Dharmarke and Sultan Chand.

3. Principles of Physical Chemistry by B.R. Puri, L.R. Sharma, M.S. Phathania, and Shobanlal Nagin Chand.
4. Essentials of Physical Chemistry by B.S. Bahl and G.D. Tuli, S. Chand.
5. Physical Chemistry by P.W. Atkins OUP Oxford; 9th edition (2009).

### **Reference Books:**

1. Principles of Physical Chemistry by S.M. Maron and C.F. Brutton N.Y.: Macmillan, (1958).
2. Physical Chemistry by R.A. Alberty and John-Wiley.
3. Physical Chemistry by G. M. Barrow, McGraw-Hill Inc. US; 6th revised edition (1996).
4. Elements of Physical Chemistry by S. Glasstone, D. Lewis, Palgrave Macmillan; 2nd revised edition (1963).
5. Fundamentals of Molecular Spectroscopy by Ban Welt and Taba McGraw-Hill Inc. US; 3rd edition (1983).
6. Physical Chemistry by G.W. Castellan Addison-Wesley Publishing Company, (1983).

### **Web Links:**

1. <https://youtu.be/PXf2KTfjEg>
2. <https://youtu.be/NyOYW07-L5g>
3. <https://youtu.be/r9UjlnZhom0>
4. <https://youtu.be/gcrVBb86VMQ>
5. <https://youtu.be/c8dDLe37ONg>
6. <https://youtu.be/UzkLP8segcs>
7. <https://youtu.be/UlpZB7bbT6M>
8. <https://youtu.be/SIU1gZJAnXQ>
9. <https://youtu.be/VLZQ-X7kst0>
10. <https://youtu.be/rcdQz9Fwy-s>
11. <https://youtu.be/tkZGjdQjQws>
12. <https://youtu.be/NP83R3lk354>
13. <https://youtu.be/7jOSbtR8mTs>
14. <https://youtu.be/Xau9cP699yE>

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## **B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (V SEMESTER)**

<b>COURSE TITLE</b>	<b>:</b>	<b>POLYMER CHEMISTRY</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHES-54</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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### **COURSE OBJECTIVES(CO)**

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While studying the Polymer Chemistry course, the student will be able to:

- CO1.** Explain about the concepts and classifications in polymerization and polymers
- CO2.** Describe the structures and properties of polymers
- CO3.** Discuss the characterization techniques involved in polymers
- CO4.** Determine the isomerism occurs in polymer molecules
- CO5.** Interpret the industrial applications of various types of polymers

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### **COURSE OUTCOMES (COC)**

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After completion of the Polymer Chemistry course, the student will be able to:

- COC1.** Acquire knowledge on the concepts and classifications in polymerization and polymers
- COC2.** Explain the structures and properties of polymers
- COC3.** Discuss the characterization techniques involved in polymers
- COC4.** Explain the isomerism occurs in polymer molecules
- COC5.** Determine the industrial applications of various types of polymers

### **Block I: Concepts in Polymers**

**Unit-1-** Definition and examples to polymerization and polymers - Classification of polymerization: chain growth, step growth, electrochemical and group transfer. polymerization - Classification of polymers: Linear, branched and cross linked polymers.

**Unit-2-** Thermoplastic and thermosetting polymers - elastomers, fibers and resins.

**Unit-3-** Techniques of polymerization - emulsion, bulk, solution and suspension.

### **Block II: Structure and Properties of Polymers**

**Unit-4-** Morphology and order in crystalline polymers - configurations of polymer chains - crystal structures of polymers - strain-induced morphology- crystalline melting point,  $T_m$ .

**Unit-5-** The crystalline melting point,  $T_m$  - the glass transition temperature,  $T_g$ , - relationship

between  $T_m$  and  $T_g$  - Effect of molecular weight, diluents, chemical structure, chain topology, branching and crosslinking.

### **Block III: Polymer Characterization**

**Unit-6-** Average molecular weight concept - Number, weight and viscosity average molecular weights - Polydispersity and molecular weight distribution.

**Unit-7-** Measurement of molecular weights - End group, viscosity, light scattering, osmotic and ultra-centrifugation methods.

**Unit-8-** Analysis and testing of polymers - chemical analysis, spectroscopic methods, thermal Analysis, XRD and SEM.

### **Block IV: Stereoisomerism in Polymers**

**Unit-9-** Introduction to stereoisomerism in polymers - types of stereoisomerism - Monosubstituted ethylenes, Disubstituted ethylenes and substituted 1,3- Butadienes.

**Unit-10-** Stereoregular polymers: significance of stereoregularity (isotactic, syndiotactic, and atactic polypropenes), Cis- and trans-1,4-poly-1,3-dienes, Cellulose and amylose.

### **Block V: Industrial Polymers**

**Unit-11-** Commercial Polymers: Polyethylene, Polyvinyl chloride, Polyamides, Polyesters, Epoxy resins and silicone polymers.

**Unit-12-** Functional polymers: High temperature, Fire retarding and electrically conducting polymers - Natural Polymers: Application and structures of starch and cellulose.

**Unit-13-** Specialty Polymers: Bio polymers - Biodegradable polymers - Biomedical polymers - Poly electrolytes - Polymer blend.

**Unit-14-** Polymer composites -Polymer nanocomposites – PN polymers - Electroluminescent polymers.

### **Text Books:**

1. Gowariker and Viswanathan, Polymer Science, Wiley Eastern, (1986).
2. S.P.Mishra, Polymer Chemistry, Wiley Eastern Ltd., New Delhi, (1993).
3. M.S.Bhatnagar, A Textbook of Polymers, Vol I, S.Chand & Company Ltd., (2004)
4. Bill Meyer, A Text Book of Polymer Chemistry, John Wiley & Sons, Singapore, (1994).
5. Charles. E. Carraher, Introduction to Polymer Chemistry, Taylor & Francis, Inc, (2006).

### **Reference Books:**

1. P. J. Flory. Principles of Polymer Chemistry, Cornell Press.
2. G. Odian, Principles of Polymerization, McGraw Hill Book Company, New York, (1973).

3. A. Rudin, The Elements of Polymer Science and Engineering. Academic Press, New York, (1973).
4. C. E. H. Brawn, The Chemistry of High Polymers, Butter worth & Co., London, (1948).
5. G. S. Krishenbaum, Polymer Science Study Guide, Gordon Breach Science publishing, New York, (1973).
6. E. A. Coolins, J. Bares and E. W. Billmeyer, Experiments in Polymer Science, Wiley Interscience, New York, (1973).

**Web Links:**

1. [https://youtu.be/\\_GDexD4Ygaw](https://youtu.be/_GDexD4Ygaw)
2. <https://youtu.be/gkVaRKA2At8>
3. <https://youtu.be/-xbXntt1sZw>
4. [https://youtu.be/El\\_7SY-q9WQ](https://youtu.be/El_7SY-q9WQ)
5. <https://youtu.be/5KPmwidovs>
6. <https://youtu.be/T0rKGecWvdQ>
7. <https://youtu.be/UX7VBdmQU4w>
8. <https://youtu.be/OqHO8IBI7ak>
9. <https://youtu.be/5WAWUguAFeQ>
10. <https://youtu.be/t6Q6ybqlr1o>
11. <https://youtu.be/8jjPDZxbbe4>
12. <https://youtu.be/nSAvyQajVzE>
13. <https://youtu.be/mhIeY6m10hc>
14. <https://youtu.be/reWG4zbijw>

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**B.Sc. CHEMISTRY PRACTICAL SYLLABUS - III YEAR  
(V SEMESTER)**

<b>COURSE TITLE</b>	<b>:</b>	<b>ORGANIC ANALYSIS AND ESTIMATION</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHES-P3</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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**COURSE OBJECTIVES (CO)**

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While studying the Organic analysis and estimation practical course, the student will be able to:

**CO1.** Explain about the basic terms and concepts involved in the organic analysis and organic estimation of an organic compound.

**CO2.** Describe the systematic analysis of an organic compound with one functional group using preliminary tests, detection of elements present, aromatic or aliphatic, saturated or unsaturated, type of the functional groups and confirmatory tests.

**CO3.** Determine the estimation of an organic compound.

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**COURSE OUTCOMES (COC)**

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After completion of the Organic analysis and estimation practical course, the student will be able to:

**COC1.** Acquire knowledge on the basic terms and concepts involved in the organic analysis and organic estimation of an organic compound.

**COC2.** Analyze the given organic compound with one functional group using preliminary tests, detection of elements present, aromatic or aliphatic, saturated or unsaturated, type of the functional groups and confirmatory tests.

**COC3.** Estimate the given organic compound

**Practical-III: ORGANIC ANALYSIS AND ESTIMATION**

**1. ORGANIC ANALYSIS**

Systematic analysis of an organic compound with one functional group: preliminary tests, detection of elements present, aromatic or aliphatic, saturated or unsaturated, type of the functional groups, confirmatory tests - Acids, Aldehydes, Ketones, Nitro compounds, Amines, Monosaccharide, Phenols & Esters.

## **2. ORGNAIC ESTIMATION**

1. Estimation of Phenol
2. Estimation of Aniline

### **Web Links:**

1. <https://youtu.be/csHwalWXG2M>
2. <https://youtu.be/C1tG69O0fXc>
3. <https://youtu.be/sqIhKvAO9j4>

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## **B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (VI SEMESTER)**

<b>COURSE TITLE</b>	<b>: INORGANIC CHEMISTRY - II</b>
<b>COURSE CODE</b>	<b>: BCHES-61</b>
<b>COURSE CREDIT</b>	<b>: 4</b>

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### **COURSE OBJECTIVES (CO)**

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While studying the Inorganic Chemistry-II course, the student will be able to:

- CO1.** Discuss about the characteristics and concepts involved in solid state chemistry
- CO2.** Describe the theories and concepts involved in coordination chemistry
- CO3.** Explain about the characteristics and concepts involved in nuclear chemistry
- CO4.** Determine the theories and applications of protic and aprotic solvents
- CO5.** Discuss about the characteristic features of organometallic compounds

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### **COURSE OUTCOMES (COC)**

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After completion of the Inorganic Chemistry-II course, the student will be able to:

- COC1.** Express the characteristics and concepts involved in solid state chemistry
- COC2.** Acquire knowledge on the theories and concepts involved in coordination chemistry
- COC3.** Obtain knowledge on the characteristics and concepts involved in nuclear chemistry
- COC4.** Discuss the theories and applications of protic and aprotic solvents
- COC5.** Gain knowledge on the characteristics features of organometallic compounds

### **Block I: Solid state Chemistry - II**

**Unit-1-** Ionic bonding in solids - lattice energy - Born equation and its derivation, radius ratio Rules.

**Unit-2-** Structures of ionic crystals - Sodium chloride, Zinc blende, Wurtzite, Rutile.

**Unit-3-** Defects in solids, non-stoichiometric compounds - semiconductors – superconductors.

## **Block II: Coordination Chemistry-II**

**Unit-4-** Magnetic properties of coordination compounds and their interpretation by Pauling's valence bond theory and crystal field theory.

**Unit-5-** Chelates - Nickel carbonyl chelates - application of chelates in medicine.

## **Block III: Nuclear Chemistry-II**

**Unit-6-** Nuclear fission and fusion reactions - half-life period.

**Unit-7-** Radioactive techniques - Geiger Muller and ionization counters - natural radioactivity - artificial radioactivity.

**Unit-8-** uses of radioisotopes - hazards of radiations - nuclear energy - nuclear reactors - radioactive waste disposal.

**Unit-9-** Applications of nuclear science in agriculture, biology and medicine.

## **Block IV: Acid Base chemistry**

**Unit-10-** Acid Base chemistry: Arrhenius, Bronsted-Lowry theory - proton donor - acceptor system - theory of solvent system, Lewis-electron dot system and Usanovich concept.

**Unit-11-** Acid-base Lux Flood Equilibria: pH of strong and weak acid solutions - Buffer solutions - Henderson equations - preparation of acidic and basic buffers.

## **Block V: Organometallic compounds-II**

**Unit-12-** Metal carbonyls; structure and application - mono and poly nuclear carbonyls - bridging and terminal carbonyls.

**Unit-13-** Metal carbenes, carbynes - metallocenes- Wilkinson's and Ziegler-Natta catalysts.

### **Text Books:**

1. Principles of Inorganic Chemistry by B.R. Puri, L.R. Sharma, Shobanlal Nagin Chand Co. (1990).
2. Inorganic chemistry by P.L. Soni, Sultan Chand Co. (1990).
3. Advanced Inorganic Chemistry I Sathya Prakas, G. D. Tuli, S. K. Basu, R. D. Madhan, S. Chand Publishing
4. Wahid U. Malik, G. D. Tuli, R. D. Madhan, Selected Topics in Inorganic Chemistry S. Chand Publishing.
5. J.E. Huheey, Inorganic Chemistry, Harper and Collins, NY, IV Edition, (1993).

6. J. D. Lee, Inorganic Chemistry, Oxford University Press; Fifth edition (2008).
7. Ashuthosh Kar, Advanced Inorganic Chemistry, CBS Publications, (2010).
8. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Milestone Publishers & Distributors/ Vishal Publishing Co.; 33rd edition (2017).

### **Reference Books:**

1. Concepts of Inorganic Chemistry by F.A. Cotton Wiley; 6th edition (1999).
2. Inorganic Reaction Mechanism – Edberg, Academic Press, (2017).
3. Inorganic Reaction Mechanism – Basolo and Pearson, John Wiley & Sons Inc; 2nd revised edition (1967).
4. Reaction Mechanism in Inorganic Chemistry by R. R. Jordan Oxford Univ.Press, 2nd edition (1998).
5. Solid State Chemistry and Its Applications; 2nd Ed., John Wiley and sons, New York, (2014).

### **Web Links:**

1. <https://youtu.be/Y17iRhBW9kg>
2. <https://youtu.be/TxTSkOEJV5U>
3. [https://youtu.be/whu\\_m-jhcHI](https://youtu.be/whu_m-jhcHI)
4. <https://youtu.be/86rNPVAtj0Y>
5. <https://youtu.be/5Gv7mbhkhmQ>
6. <https://youtu.be/tt4hMzq0MxI>
7. <https://youtu.be/dW7VNsUgx74>
8. <https://youtu.be/4xxqDE4DsEY>
9. <https://youtu.be/uvuXL55yzpw>
10. <https://youtu.be/OP6RKqSp1Xw>
11. <https://youtu.be/kBzPTEB21Po>
12. <https://youtu.be/uL1OVeVD3ps>
13. <https://youtu.be/prG1Ah8b1gE>

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## **B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (VI SEMESTER)**

<b>COURSE TITLE</b>	<b>:</b>	<b>ORGANIC CHEMISTRY - II</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHES-62</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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### **COURSE OBJECTIVES (CO)**

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While studying the Organic Chemistry-II course, the student will be able to:

**CO1.** Discuss about the definition and applications of retrosynthetic analysis

**CO2.** Describe the concepts involved in the chirality of organic molecules

**CO3.** Interpret the optical activity and conformational analysis of organic molecules

**CO4.** Explain about the oxidation and reduction reactions and its types

**CO5.** Describe the principles and applications of UV and Mass spectroscopy

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### **COURSE OUTCOMES (COC)**

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After completion of the Organic Chemistry-II course, the student will be able to:

**COC1.** Acquire knowledge on the definition and applications of retrosynthetic analysis

**COC2.** Study the concepts involved in the chirality of organic molecules

**COC3.** Describe the optical activity and conformational analysis of organic molecules

**COC4.** Explain about the oxidation, reduction and condensation reactions and its types

**COC5.** Discuss about the principles and applications of UV and Mass spectroscopy

### **Block I: Retrosynthetic analysis**

**Unit-1-** Introduction and definition to retro synthetic analysis - disconnection - synthons - synthetic equivalents (SE).

**Unit-2-** Functional group interconversion (FGI) - Linear, Convergent and Combinatorial syntheses - Target molecule (TM) - Applications.

## **Block II: Chirality - II**

**Unit-3-** Optical isomers - enantiomers - diastereomers - epimers.

**Unit-4-** Notation of optical isomers - Cahn-Ingold-Prelog rules - R and S notations for optical isomers with one and two asymmetric carbon atoms.

**Unit-5-** Erythro, Threo, D and L representations.

## **Block III: Optical activity - II**

**Unit-6-** Potential energy diagram- relative stability of conformers on the basis of steric effect, dipole -dipole interaction and H-bonding.

**Unit-7-** Conformational analysis of ethane, propane, n-butane, 1,2-dihaloethane, 1,2-glycol, cyclopentane and cyclohexane.

## **Block IV: Oxidation, Reduction and Condensation reactions**

**Unit-8-** Introduction and definition to oxidation and reduction reactions.

**Unit-9-** MPV, Birch, Clemmensen and Wolf Kishner reductions.

**Unit-10-** Introduction and definition examples to condensation reactions - Aldol, Perkin, and Knoevenagel condensations.

## **Block V: UV and Mass Spectroscopy**

**Unit-11-** Introduction and principles of UV Spectroscopy - origin of electronic spectra-Laws of absorbance - effect of conjugation - Woodward-Fieser rules.

**Unit-12-** Applications of UV spectroscopy to simple molecules.

**Unit-13-** Introduction and principles of Mass spectroscopy

**Unit-14-** Applications of UV spectroscopy to simple molecules.

### **Text Books:**

1. A text book of Organic Chemistry by Arun Bhal, B. S. Bhal, and S.Chand.
2. Stereochemistry, Conformation and Mechanism by P.S. Kalsi, New Academic Science, (2020).
3. Organic Chemistry by I. L.Finar, and ELBS Longman, Volume I, 5<sup>th</sup> edition.
4. Organic Chemistry by Anupa Saha and Anup Pathak, Volume I & II, Books & Allied Ltd (2013).
5. Advanced Organic Chemistry (Organic Synthesis, Heterocycles & Biomolecules) by N. Tewari, Books & Allied Ltd (2013).

6. Reactions, Rearrangements and Reagents by S.N. Sanyal, Bharati Bhawan Publishers Distributors; Fourth edition (2019).

### **Reference Books:**

1. Organic chemistry by P.H. Pine, McGraw-Hill Inc. US; 5th revised edition (1987).
2. Spectroscopic methods in organic chemistry by Williamms and Fleming, 5th edition. Springer (2009).
3. Stereochemistry of Organic Compounds, by Ernest L. Eliel, Samuel H. Wilen, Wiley; 1st edition (2008).
4. Organic Spectroscopy, W. Kemp, MACMILLAN; 2nd edition, (2019).
5. NMR in Chemistry, W. Kemp, Springer, Macmillan Publishers Limited, (1986).

### **Web Links:**

1. <https://youtu.be/AVPnfEYhhiI>
2. <https://youtu.be/NwWJYCoEJHw>
3. <https://youtu.be/sxNsgedXrow>
4. <https://youtu.be/8rpkERrJnEA>
5. <https://youtu.be/cEeDqqBRrbQ>
6. <https://youtu.be/3QjH9sSa-fQ>
7. [https://youtu.be/DxgJB7\\_FkTk](https://youtu.be/DxgJB7_FkTk)
8. <https://youtu.be/5rtJdjas-mY>
9. <https://youtu.be/yJsOrKly3XQ>
10. <https://youtu.be/OBT3otCRBxg>
11. <https://youtu.be/7jOSbtR8mTs>
12. <https://youtu.be/6Mnzil9anOs>
13. <https://youtu.be/VUIPYnWLSDE>
14. <https://youtu.be/6Mnzil9anOs>

## **B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (VI SEMESTER)**

<b>COURSE TITLE</b>	<b>:</b>	<b>PHYSICAL CHEMISTRY - II</b>
<b>COURSE CODE</b>	<b>:</b>	<b>BCHE-63</b>
<b>COURSE CREDIT</b>	<b>:</b>	<b>4</b>

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### **COURSE OBJECTIVES (CO)**

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While studying the Physical Chemistry-II course, the student will be able to:

- CO1.** Explain about the laws and terms involved in thermodynamics
- CO2.** Describe the basics and terms of Group theory
- CO3.** Determine the terms and applications of electrochemistry
- CO4.** Interpret the characteristics and applications of colloids and nanomaterials
- CO5.** Discuss about the principles and applications of molecular spectroscopy

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### **COURSE OUTCOMES (COC)**

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After completion of the Physical Chemistry-II course, the student will be able to:

- COC1.** Define the laws and terms involved in thermodynamics
- COC2.** Explain the basics and terms of Group theory
- COC3.** Gain knowledge on the terms and applications of electrochemistry
- COC4.** Describe the characteristics and applications of colloids and nanomaterials
- COC5.** Discuss about the principles and applications of molecular spectroscopy

### **Block I: Thermodynamics - II**

**Unit-1-** Second law of thermodynamics and its need.

**Unit-2-** Carnots cycle - efficiency - Carnot's theorem (statement only) - concept of entropy - entropy of an ideal gas - Gibbs free energy - Helmholtz free energy - Gibbs & Helmholtz equations.

**Unit-3-** Third Law of Thermodynamics - Nernst heat theorem - absolute entropy.

## **Block II: Group theory**

**Unit-4-** Introduction to group theory - symmetry elements - symmetry operations - point groups - identification and determination.

**Unit-5-** Comparison of molecular and crystallographic symmetry.

**Unit-6-** Group multiplication table - Matrix representation of symmetry operations.

## **Block III: Electrochemistry - II**

**Unit-7-**Types of electrochemical cells: Chemicals cells - liquid junction potential - salt bridge

**Unit-8-** Concentration cells - definition and types with examples - e.m.f. of electrolyte concentration cells.

**Unit-9-** Commercial cells - primary and secondary cells - dry cell - lead storage cell and fuel cells.

## **Block IV: Nanomaterials**

**Unit-10-** Introduction to Nano materials - Types of nanoparticles - Gold, Silver, Cobalt, Alumina and Titania nanoparticles.

**Unit-11-** Techniques to synthesize nanoparticles - physical methods - physical vapour deposition (evaporation and sputtering) - chemical methods.

## **Block V: Molecular Spectroscopy -II**

**Unit-12-** Introduction to Vibrational spectra - selection rule - Hooke's law.

**Unit-13-** Simple harmonic oscillator - vibrational energy level diagram.

**Unit-14-** Anharmonic oscillator- vibrational spectra of H<sub>2</sub>O and CO<sub>2</sub>.

### **Text Books:**

1. Physical Chemistry by Amrita Lal De and Abhranil De, Volume I, Narosa Publishing, (2009).
2. A text book of Physical Chemistry by P.L. Soni, Dharmarke and Sultan Chand.
3. Symmetry and Spectroscopy of Molecules, Veera Reddy, newage publishers; Second edition (2009).
4. Principles of Physical Chemistry by B.R. Puri, L.R. Sharma, M.S.Phathania, and Shobanlal Nagin Chand.
6. Physical Chemistry by P.W. Atkins OUP Oxford; 9 edition (2009).

## **Reference Books**

1. Principles of Physical Chemistry by S.M.Maron and C.F.Brutton N.Y. Macmillan, (1958).
2. Physical Chemistry by R.A. Alberty and John-Wiley.
3. Physical Chemistry by G. M. Barrow, McGraw-Hill Inc.,US; 6th Revised edition edition (1996).
4. Elements of Physical Chemistry by S. Glasstone, D.Lewis, Palgrave Macmillan; 2nd revised edition (1963).
5. Fundamentals of Molecular Spectroscopy by Ban Welt and Taba McGraw-Hill Inc.,US; 3rd Revised edition (1983).
6. Physical Chemistry by G.W.Castelan Addison-Wesley Publishing Company, (1983).

## **Web Links:**

1. <https://youtu.be/DWiCaDPM7Hk>
2. <https://youtu.be/BznPadlKfKM>
3. <https://youtu.be/KLQ3kJ-IzUQ>
4. <https://youtu.be/BE8yQyA9RUc>
5. <https://youtu.be/gPBxBx0LWbA>
6. <https://youtu.be/5dKkACDipyg>
7. <https://youtu.be/1futudpHHVs>
8. <https://youtu.be/ar3W4HBFZjg>
9. <https://youtu.be/obpyUZ6R8Yc>
10. <https://youtu.be/MlnpUe8b5e4>
11. <https://youtu.be/m8SmeYJkHg8>
12. <https://youtu.be/BGQKjmgRjQs>
13. <https://youtu.be/g6r9bsAOOho>
14. <https://youtu.be/PXPZgjt24PA>

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## B. Sc. CHEMISTRY SYLLABUS FOR III YEAR (VI SEMESTER)

<b>COURSE TITLE</b>	<b>: ENVIROMENTAL CHEMISTRY AND LABORATORY HYGIENE</b>
<b>COURSE CODE</b>	<b>: BCHES-64</b>
<b>COURSE CREDIT</b>	<b>: 4</b>

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### **COURSE OBJECTIVES (CO)**

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While studying the Environmental Chemistry and Laboratory Hygiene course, the student will be able to:

**CO1.** Discuss about the air quality, sources, classification and effect of air pollution and their preventive methods.

**CO2.** Determine the water quality, sources, classification and effect of water pollution and their preventive methods

**CO3.** Describe the treatment techniques of water

**CO4.** Interpret the sources, classification and effect of radioactive pollution and their preventive methods

**CO5.** Discuss the characteristics and types of laboratory hygiene and safety rules

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### **COURSE OUTCOMES (COC)**

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After completion of the Environmental Chemistry and Laboratory Hygiene course, the student will be able to:

**COC1.** Acquire knowledge on the air quality, sources, classification and effect of air pollution and their preventive methods

**COC2.** Describe the water quality, sources, classification and effect of water pollution and their preventive methods

**COC3.** Discuss the treatment techniques of water

**COC4.** Determine the sources, classification and effect of radioactive pollution and their preventive methods

**COC5.** Interpret the characteristics and types of laboratory hygiene and safety rules

### **Block I: Air Quality and Pollution**

**Unit-1-** Bio-geo chemical cycles: Carbon, Oxygen, Nitrogen, Phosphorous and Sulphur. **Unit-2-** Sources of air pollution - classification and effects of air pollutants: ozone depletion, acid rain, Green-house effect, climate change, global warming - control methods.

## **Block II: Water Quality and Pollution**

**Unit-3-** Water Quality parameters: colour, odour, temperature, turbidity, hardness, alkalinity, pH, conductivity, ions, SS, VOC, TDS, DO, BOD, COD, micro nutrients, heavy metals and Coli-form - Potable water and Industrial water quality.

**Unit-4-** Sources of water pollution - effect of water pollutants - control methods.

## **Block III: Water Treatment**

**Unit-5-** Pre and primary methods: aeration, filtration, sedimentation, precipitation, coagulation and flocculation, disinfection.

**Unit-6-** Secondary methods: activated sludge, trickling filters, RBC, anaerobic digestion, lagoons and ponds.

**Unit-7-** Tertiary/Advanced methods: activated carbon, ultrafiltration, ion-exchange, electro-dialysis and reverse osmosis.

## **Block IV: Radioactive pollution**

**Unit-8-** Sources of radioactive pollution - types and effect of radioactive pollutants.

**Unit-9-** Preventive methods for radioactive pollution.

## **Block V: Laboratory hygiene and Safety rules**

**Unit-10-** Introduction to common safety methods and rules.

**Unit-11-** Storage and handling of Carcinogenic chemicals, Poisonous chemicals, easily vaporizable chemicals and Inflammable Chemicals.

**Unit-12-** Waste disposal - Fume disposal - General precautions for avoiding lab accidents - First aid techniques.

### **Text Books:**

1. Textbook of Environmental Chemistry By Balram Pani I. K. International Pvt Ltd, (2010).
2. Environmental Chemistry, Anil K. De, New Age International, (2003).
3. Environmental Pollution Control Engineering, C. S. Rao, New Age International, (2007).
4. Textbook of Environmental Chemistry, O. D. Tyagi, M. Mehra, Anmol Publications, (1990).
5. Environmental Pollution Monitoring and Control, S. M. Khopkar, New Age International, (2007).

6. Environmental Chemical Analysis, Second Edition, S. Mitra, B.B. Kebbekus, Taylor & Francis, (2016).

### **Reference Books:**

1. A.K.De, Environmental Chemistry, New Age International, (2003).
2. R.Shangi, M.M.Srivatsava, Green Chemistry, Narosa Publishers, New Delhi, (2003).  
S.E.Harnung, M.S.Johnson, Chemistry and the Environment, Cambridge University Press, (2012).
3. M.Z.Jacobson, Air Pollution and Global Warming 2nd Edition, Cambridge University Press, (2012).
4. J.M.Bear, Environmental Chemistry in Society, CRC press, (2013).
5. P.T.Anasta, Green Chemistry: Theory & Practice, Oxford University Press, (2000).
6. A.E.Marteel-Parrish, M.A.Abraham, Green Chemistry and Engineering: A Pathway to Sustainability, Wiley, (2014).
7. V.K. Ahluwalia, Green Chemistry- Environmentally benign Reactions, Ane Books India, (2000).

### **Web Links:**

1. <https://youtu.be/bbmsjTkOyrs>
2. <https://youtu.be/I7Z34WU257U>
3. <https://youtu.be/RnEYXHBVJNI>
4. <https://youtu.be/15yXi3Bxyr4>
5. <https://youtu.be/q9NOKDXw3Y8>
6. <https://youtu.be/7vYygIQqo00>
7. [https://youtu.be/\\_LSKHSQmwwE](https://youtu.be/_LSKHSQmwwE)
8. [https://youtu.be/uii9PSt0\\_8U](https://youtu.be/uii9PSt0_8U)
9. <https://youtu.be/72t5ruyTXZ4>
10. <https://youtu.be/mous5Jo0u9M>
11. <https://youtu.be/pr1uaIaEtWo>
12. <https://youtu.be/yB4gV-IzbuU>

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**B.Sc. CHEMISTRY PRACTICAL SYLLABUS - III YEAR  
(VI SEMESTER)**

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**COURSE TITLE : GRAVIMETRIC ANALYSIS &  
PHYSICAL CHEMISTRY  
EXPERIMENTS**

**COURSE CODE : BCHES-P4**

**COURSE CREDIT : 4**

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**COURSE OBJECTIVES (CO)**

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While studying the Gravimetric analysis and Physical chemistry practical course, the student will be able to:

**CO1.** Describe the basic terms and concepts involved in the gravimetric analysis and applications of physical chemistry experiments.

**CO2.** Explain about how the compounds are analyzed using the gravimetric analysis method.

**CO3.** Discuss the application of physical chemistry experiments such as Ester hydrolysis, Determination of Critical Solution Temperature, Conductivity titration between an acid and a base, Determination of dissociation constant by conductometry and Determination of partition coefficient.

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**COURSE OUTCOMES (COC)**

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After completion of the Gravimetric analysis and Physical chemistry practical course, the student will be able to:

**COC1.** Acquire knowledge on the basic terms and concepts involved in the gravimetric analysis and applications of physical chemistry experiments.

**COC2.** Analyze the given compound using the gravimetric analysis method.

**COC3.** Describe the applications of physical chemistry experiments such as Ester hydrolysis, Determination of Critical Solution Temperature, Conductivity titration between an acid and a base, Determination of dissociation constant by conductometry and Determination of partition coefficient.

**1. GRAVIMETRIC ANALYSIS**

1. Estimation of Barium as Barium Chromate.
2. Estimation of Sulphate as Barium Sulphate.
3. Estimation of Lead as Lead Chromate.

## 2. PHYSICAL CHEMISTRY EXPERIMENTS

1. Ester hydrolysis (Relative strength of acids)
2. Determination of Critical Solution Temperature of Phenol-Water system
3. Conductivity titration between an acid and a base (HCl vs NaOH).
4. Determination of dissociation constant of a weak acid (acetic acid) by conductometry.
5. Determination of partition coefficient of Iodine between carbon tetra chloride and Water.

### **Web Links:**

1. <https://youtu.be/cT1rxDA13As>
2. <https://youtu.be/DCLp6A8PMnI>
3. <https://youtu.be/AquLTtaiH68>
4. <https://youtu.be/pvE5eon0LLU>
5. [https://youtu.be/DKMifBNAZ\\_M](https://youtu.be/DKMifBNAZ_M)
6. <https://youtu.be/-GS6uoFf3qQ>
7. <https://youtu.be/PrI9iMbLezY>
8. [https://youtu.be/tv9I0\\_8\\_dJo](https://youtu.be/tv9I0_8_dJo)

# TAMIL NADU OPEN UNIVERSITY



Ancillary Chemistry courses for B.Sc. – Physics/Botany/Zoology

Department of Chemistry

School of Sciences

Tamil Nadu Open University

Saidapet, Chennai – 600 015

Tamil Nadu, INDIA.

**Ancillary Chemistry courses for B.Sc. – Physics/Botany/Zoology**

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**COURSE TITLE : GENERAL CHEMISTRY - I**

**COURSE CODE : BCHESA - 31**

**COURSE CREDIT : 3**

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**COURSE OBJECTIVES (CO)**

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While studying the General Chemistry - I course, the student shall be able to:

- CO1.** Describe about the need, types and uses of chemical bonds
- CO2.** Define the need, types and uses of organic reactions
- CO3.** Interpret the characteristics, types and applications of catalysis
- CO4.** Study the characteristics, types and applications of biomolecules
- CO5.** Explain on the types and effect of pollutions

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**COURSE OUTCOMES (COC)**

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After completion of the General Chemistry - I course, the student will have the ability to:

- COC1.** Explain the need, types and uses of chemical bonds
- COC2.** Describe the need, types and uses of organic reactions
- COC3.** Elaborate the characteristics, types and applications of catalysis
- COC4.** Interpret the characteristics, types and applications of biomolecules
- COC5.** Describe the types and effect of pollutions

**Block I: Chemical bonds**

**Unit-1-** Introduction, definition and need of chemical bond.

**Unit-2-**Types of bonds: Ionic, Covalent, Co-ordinate covalent, Metallic and Hydrogen bond with suitable illustrations.

## **Block II: Organic reactions**

**Unit-3**-Introduction, definition and example to an Organic reaction-Definition to Nucleophiles and Electrophiles with suitable illustrations.

**Unit-4**-Types of organic reactions - Addition, Elimination, Substitution, Rearrangement and Polymerization reactions with suitable illustrations.

## **Block III: Catalysis**

**Unit-5**-Introduction, definition and example to Catalysis and Catalysts- Types of catalysts - Positive, Negative, Homogeneous and Heterogeneous catalysts.

**Unit-6**-Definition and example to Autocatalysis, Enzyme catalysis and Acid/Base catalysis.

## **Block IV: Biomolecules - I**

**Unit-7**-Introduction and definition to Carbohydrates - Monosaccharides, Disaccharides and Polysaccharides - classification, properties and structures.

**Unit-8**-Introduction and definition to Vitamins -classifications - structure, occurrence and deficiency diseases caused by Vitamin A, B complex, C, D, E and K.

## **Block V: Pollution**

**Unit-9**-Air pollution: definition, sources and effects of air pollutants - effects of fluorocarbons, ozone layer and green-house effect

**Unit-10**-Water pollution: definition, sources and effects of water pollution - industrial effluents - water sewages - water pollution control - water treatment.

**Unit-11**-Radioactive pollution: sources, nuclear traces, wastes, effect of radiation and preventive methods.

### **Text Books:**

1. Environmental Chemistry and Green Chemistry by Asim K. Das.
2. Introduction to Chromatography by V.K. Srivastava, K.K. Srivastava. Edition II.
3. Organic Chemistry by Anupa Saha and Anup Pathak, Volume I & II.
4. A text book of Organic Chemistry by Arun Bhal, B.S. Bhal, and S. Chand.
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7. Text book of organic chemistry, P.L. Soni.
8. Organic chemistry of Natural Products by GurdeepWat, Volume I.
9. A Text book of Medical Biochemistry by S. Ramakrishnan, K.G. Prasanan and R. Rajan.
10. Fundamentals of Biochemistry by J.L. Jain.
11. A Text of Medical biochemistry by AmbikaShanmugam.
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3. Advanced organic chemistry (McGraw-Hill) J. March.
4. Inorganic Chemistry, J.E. Huheey, Harper and Collins, NY, IV Edition, (2010).
5. Concise Inorganic Chemistry, J. D. Lee,Wiley; Fifth Edition edition (2016).
6. Principles of Physical chemistry, P.W. Atkins, C.J. Clougston, Longman, (1986).
7. A.K.De, "Environmental Chemistry", New Age International, (2003).
8. R.Shangi, M.M.Srivatsava, "Green Chemistry", Narosa Publishers, New Delhi, (2003).
9. M.Z.Jacobson, Air Pollution and Global Warming 2nd Edition, Cambridge University Press, (2012).

### **Web Links:**

1. <https://www.khanacademy.org/science/chemistry/chemical-bonds>
2. [https://chem.libretexts.org/Bookshelves/General\\_Chemistry/Map%3A\\_General\\_Chemistry\\_\(Petrucci\\_et\\_al.\)/27%3A\\_Reactions\\_of\\_Organic\\_Compounds/27.01%3A\\_Organic\\_Reactions%3A\\_An\\_Introduction](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_(Petrucci_et_al.)/27%3A_Reactions_of_Organic_Compounds/27.01%3A_Organic_Reactions%3A_An_Introduction)
1. <https://www.britannica.com/science/catalysis>
2. <https://byjus.com/chemistry/classification-of-carbohydrates-and-its-structure/>
3. <https://www.britannica.com/science/vitamin>
4. <https://www.britannica.com/science/pollution-environment>

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**COURSE TITLE : GENERAL CHEMISTRY – II**

**COURSE CODE : BCHESA - 41**

**COURSE CREDIT : 3**

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### **COURSE OBJECTIVES (CO)**

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While studying the General Chemistry - II course, the student shall be able to:

**CO1.** Explain types of mass units and terms involved in the volumetric analysis

**CO2.** Define the types and uses of purification techniques of organic molecules

**CO3.** Study the definition, types and applications of polymerization and polymers

**CO4.** Discuss the definition, types and applications of biomolecules

**CO5.** Describe on the types of laboratory hygiene and safety rules

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### **COURSE OUTCOMES (COC)**

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After completion of the General Chemistry - II course, the student will have the ability to:

**COC1.** Describe the types of mass units and terms involved in the volumetric analysis

**COC1.** Explain the types and uses of purification techniques of organic molecules

**COC1.** Define the definition, types and applications of polymerization and polymers

**COC1.** Define definition, types and applications of biomolecules

**COC1.** Explain the characteristics and types of laboratory hygiene and safety rules

### **Block I: Mass units and Volumetric analysis**

**Unit-1-** Mass units: Definition and examples to Molarity, Molality and Normality - Weight and volume composition percentage

**Unit-2-** Volumetric analysis: Introduction and principle - Titration - Equivalence point - End Point - Analysis of end point - Indicators - Standard solutions (primary and secondary).

### **Block II: Purifications of Organic Compounds**

**Unit-3-** Types of purification - Distillation, Fractional distillation, Steam distillation, Distillation under reduced pressure - Sublimation - Crystallizations - Fractional Crystallization.

**Unit-4-** Basic principle and types of Chromatography - RF value - applications of Column, Thin layer and Paper Chromatography techniques.

### **Block III: Polymers**

**Unit-5-** Definition and examples to polymerization and polymers - types and properties of polymers - Addition and Condensation polymerization.

**Unit-6-** Natural rubber - Vulcanization of rubber - Preparation and applications of Polythene, Polystyrene, Teflon and Buna-S-rubber.

### **Block IV: Biomolecules - II**

**Unit-7-** Definition, examples and uses of Hormones, reproductive hormones, Anti-malarial, Antiseptics and Disinfectants - Definition and uses of Chloroquine, Pamaquine chloramine-T, Iodoform and Dettol.

**Unit-8:-** Definition and uses of Antibiotics: Definition and uses of Penicillin, Chloromycetin, Streptomycin and Tetracycline - Definitions and examples for analgesics, anaesthetics, antipyretics and antiinflammatory.

### **Block V: Laboratory hygiene and Safety rules**

**Unit-9-** Common safety methods - Storage and handling of Carcinogenic chemicals, Poisonous chemicals, easily vaporizable chemicals and Inflammable Chemicals.

**Unit-10-** Waste disposal - Fume disposal - General precautions for avoiding lab accidents - First aid techniques.

### **Text Books:**

1. Environmental Chemistry and Green Chemistry by Asim K. Das.
2. Introduction to Chromatography by V.K. Srivastava, K.K. Srivastava. Edition II.
3. Organic Chemistry by AnupaSaha and AnupPathak, Volume I & II.

4. A text book of Organic Chemistry by ArunBhal, B.S. Bhal, and S. Chand.
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8. Organic chemistry of Natural Products by GurdeepWat, Volume I.
9. A Text book of Medical Biochemistry by S. Ramakrishnan, K.G. Prasanan and R. Rajan.
10. Fundamentals of Biochemistry by J.L. Jain.
11. A Text of Medical biochemistry by AmbikaShanmugam.
12. Principles of Physical Chemistry by Puri, Sharma and Pathania.

### **Reference Books:**

1. A text book of Oranic Chemistry by ArunBhal, B. S. Bhal, and S.Chand.
2. Stereochemistry, Conformation and Mechanism by P.S. Kalsi, New Academic Science, (2020).
3. Organic Chemistry by I. L.Finar, and ELBS Longman, Volume I, 5<sup>th</sup> edition.
4. Organic Chemistry by AnupaSaha and Anup Pathak, Volume I & II, Books & Allied Ltd (2013).
5. Advanced Organic Chemistry (Organic Synthesis, Heterocycles& Biomolecules) by N. Tewari, Books & Allied Ltd (2013).
6. Reactions, Rearrangements and Reagents by S.N. Sanyal, BharatiBhawan Publishers & Distributors; 4th edition (2019).

### **Web Links:**

1. <https://byjus.com/question-answer/molarity-molality-normality-formality/>
2. <https://www.vedantu.com/question-answer/explain-molarity-molality-normality-formality-class-11-chemistry-cbse-5ff35181f291a76c57cb7630>
3. <https://www.britannica.com/science/volumetric-analysis>
4. <https://byjus.com/chemistry/volumetric-analysis/>
5. <https://byjus.com/jee/purification-of-organic-compounds/>

6. <https://www.youtube.com/watch?v=Yck4a4JG96k>
7. <https://byjus.com/chemistry/antibiotics-types-and-side-effects/>
8. <https://www.thermofisher.com/in/en/home/references/gibco-cell-culture-basics/cell-culture-laboratory-safety/guidelines-for-safe-laboratory-practices.html>

# TAMIL NADU OPEN UNIVERSITY



## Chemistry course as a Generic Elective

Department of Chemistry

School of Sciences

Tamil Nadu Open University

Saidapet, Chennai - 600 015

Tamil Nadu, INDIA.

**Chemistry Course for Other Departments  
as a Generic Elective (GE) course**

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**COURSE TITLE : GENERAL CHEMISTRY**

**COURSE CODE : BCHYE**

**COURSE CREDIT : 2**

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**COURSE OBJECTIVES (CO)**

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While studying the General Chemistry course, the student shall be able to:

- CO1.** Know about the need, types and uses of chemical bonds
  - CO2.** Understand the need, types and uses of organic reactions
  - CO3.** Gain knowledge on the characteristics, types and applications of catalysis
  - CO4.** Study the definitions, types and applications of biomolecules
  - CO5.** Acquire knowledge on the types and effect of pollutions
- 

**COURSE OUTCOMES (COC)**

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After completion of the General Chemistry course, the student will have the ability to:

- COC1.** Understand the need, types and uses of chemical bonds
- COC2.** Get awareness on the need, types and uses of organic reactions
- COC3.** Know about the definitions, types and applications of catalysis
- COC4.** Acquire knowledge on the characteristics, types and applications of biomolecules
- COC5.** Gain knowledge on the types and effect of pollutions

**Block I: Chemical bonds**

**Unit-1-** Introduction, definition and need of chemical bond.

**Unit-2-**Types of bonds: Ionic, Covalent, Co-ordinate covalent, Metallic and Hydrogen bond with suitable illustrations.

## **Block II: Organic reactions**

**Unit-3-**Introduction, definition and example to an Organic reaction-Definition to Nucleophiles and Electrophiles with suitable illustrations.

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**Unit-5-**Introduction, definition and example to Catalysis and Catalysts- Types of catalysts - Positive, Negative, Homogeneous and Heterogeneous catalysts.

**Unit-6-**Definition and example to Autocatalysis, Enzyme catalysis and Acid/Base catalysis.

## **Block IV: Biomolecules**

**Unit-7-**Introduction and definition to Carbohydrates - Monosaccharides, Disaccharides and Polysaccharides -Introduction and definition to Vitamins -classifications - deficiency diseases caused by Vitamin A, B complex, C, D, E and K.

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**Unit-9-**Air pollution: definition, sources and effects of air pollutants - effects of fluorocarbons, ozone layer, acid rain and green-house effect

**Unit-10-**Water pollution: definition, sources and effects of water pollution - industrial effluents - water sewages - water pollution control - water treatment.

**Unit-11-**Radioactive pollution: sources, nuclear wastes, effect of radiation and preventive methods.

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10. Fundamentals of Biochemistry by J.L. Jain.
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5. Concise Inorganic Chemistry, J. D. Lee,Wiley; Fifth Edition edition (2016).
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8. R.Shangi, M.M.Srivatsava, "Green Chemistry", Narosa Publishers, New Delhi, (2003).
9. M.Z.Jacobson, Air Pollution and Global Warming 2nd Edition, Cambridge University Press, (2012).

### **Web Links:**

1. <https://youtu.be/bbmsjTkOyrs>
2. <https://youtu.be/I7Z34WU257U>
3. <https://youtu.be/RnEYXHBVJNI>
4. <https://youtu.be/15yXi3Bxyr4>
5. <https://youtu.be/q9NOKDXw3Y8>