



TRIPURA UNIVERSITY

**(A Central University)
Suryamaninagar-799022**

Syllabus

For

Semester – II

CHEMISTRY (Major)

Year 2014



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Syllabus

For

Semester-II

**CHEMISTRY (Minor)
2014**

B.Sc. Pass, Semester – II

Subject – Chemistry

Paper – C1P2 (A)

Full Marks: 50 (40+10)

Time: 2 hours

Unit-I General Chemistry (Marks: 20)

30 Lectures

- A. Chemical bonding (15 Lectures):** (i) **Ionic bond:** lattice energy, Born-Haber cycle, ionic solids: radius ratio rule and its limitations, ionic potential, polarizing power and polarisability, Fajan's rule. (ii) **Covalent bond:** Basic concepts of valence bond theory and its limitations, resonance and resonance energy, hybridization involving s, p, d orbitals; sigma and pi-bonds, bond length, bond order, bond energy, formal charge, dipole moment, percentage of ionic character of covalent bond, VSEPR theory and its applications, LCAO-MO theory and its application to homonuclear diatomic molecules (H_2 , B_2 , C_2 , N_2 , O_2 , F_2); hydrogen bond, metallic bond (electron sea model and band theory).
- B. Chemical equilibrium (8 Lectures):** Reversible and irreversible reactions, law of mass action, derivation of expression for equilibrium constant for homogeneous and simple heterogeneous systems, temperature, pressure and concentration dependence on equilibrium state- Le-Chatelier principle, simple application, inter relations hip between K_p , K_c and K_x , characteristic of the equilibrium state.
- C. Thermochemistry (7 Lectures):** Exothermic and endothermic reactions; enthalpy (heat of formation, reaction, combustion, solution, neutralization, atomization, etc., laws of thermochemistry, bond dissociation energy, Born – Haber cycle.

Unit-II Inorganic Chemistry (Marks: 20)

30 Lectures

- A. Coordination Chemistry (15 lectures):** Werner's theory, IUPAC nomenclature, different types of ligands, multidentate ligands, coordination number and stereochemistry (up to coordination number 6); chelates, inner metallic complexes, types of isomerism in coordination compounds, bonding in coordination compounds: Valence Bond Theory (VBT). Double Salts and their applications. Molecular Orbital Theory: H_2 , N_2 and O_2
- B. Magnetochemistry (15 lectures):** Concept of diamagnetism, paramagnetism, ferromagnetism and antiferromagnetism, origin of paramagnetic moment: electron spin moment and orbital angular moment, magnetic susceptibility and magnetic moment; magnetic susceptibility measurement by Gouy methods.

B.Sc. Pass, Semester – II
Subject – Chemistry
Subject – Chemistry (Practical)
Paper – C1P2 (B)
Full Marks: 50 (40+10)
Time: 6 hours

A. Inorganic Practical: Marks : 25 (20+5); Time: 4 hours

Inorganic qualitative analysis (Marks: 20)

Qualitative analysis of inorganic salt mixtures containing not more than three radicals from the following list: Silver, lead, bismuth, copper, antimony, tin, iron, aluminium, chromium, manganese, cobalt, zinc, nickel, calcium, barium, strontium, magnesium, potassium, ammonium; chloride, bromide, iodide, sulphate, sulphide, sulphite, phosphate, borate, nitrate, nitrite, arsenate, oxides and hydroxides.

B. Organic Practical; Marks : 25 (20+5); Time: 2 hours

Organic Preparation*: Any one preparation is to be set in the practical examination.

Exp. No.	Experiment Titles
1.	Preparation of 7-hydroxy-4-methyl coumarin by Pechmann method
2.	Acetylation of aniline via green method
3.	Preparation of dibenzylidene acetone by condensation reaction.

*Identity of the product should be done by MP comparison with literature.

RECOMMENDED BOOKS

Organic Chemistry(Pass):

1. Organic Chemistry - I.L. Finar, Vol. I, 6th Edn. ELBS
2. Advanced Organic Chemistry - B.S. Bahl & A. Bahl,
3. Advanced Organic Chemistry, Reactions & Mechanism – Mukherjee & Singh
4. Organic Chemistry - R.T. Morison & R.N. Boyd,
5. Stereochemistry of Carbon Compounds - D. Nashipuri,
6. Basic Stereochemistry of Organic Molecules - Subrata Sengupta,
7. Advanced Organic Chemistry - N.K. Visnoi
8. Jaiba Rasayan - Subrata Sengupta,

Inorganic Chemistry(Pass):

1. Inorganic Chemistry Vol. I & II - R.L. Datta
2. Advanced Inorganic Chemistry Vol. I & II - Prakash, Tuli, Basu and Madan,
3. Fundamental concepts of Inorganic Chemistry - A.K. Das
4. General and Inorganic Chemistry - Vol R. P. Sarkar
5. General and Inorganic Chemistry - S.N. Podder & S.P. Ghosh
6. Fundamental concepts of Inorganic Chemistry- Vol.1 & 2 – Ashim Kr. Das
7. Inorganic Chemistry – Puri, Sharma and Kalia
8. Inorganic Chemistry – J.D. Lee
9. General and Inorganic Chemistry (Part-I & II) R. Sarkar
10. Basic Inorganic Chemistry – Cotton and Wilkinson
11. Inorganic Chemistry – Principles of Structure and Reactivity- Huhey, Keiter & Medhi

Physical Chemistry(Pass):

1. Bhouta Rasayan - N.N.Kundu, Vol. I & II
2. Essentials of Physical Chemistry - Bahl & Tuli,
3. Bhouta Rasayan - P.C. Rakshit & P.R. Gupta,
4. Elementary Physical Chemistry - S.R. Palit,

Practical Chemistry(Pass):

1. A Manual of Practical Chemistry (Vol. I & II) - R.C. Bhattacharjee
2. University hand book of undergraduate chemistry experiments -
G.N. Mukherjee, University of Calcutta.
3. College Practical Chemistry - Ahluwalia, Dingra & Gulati.
4. Bebaharic Rasayan, Podder & Ghosh

B.Sc. Pass, Semester – II
Subject – Chemistry

Paper – C1P2 (A)
Full Marks: 50 (40+10)
Time: 2 hours

Unit-I General Chemistry (Marks:20) 30 Lectures

A. Chemical bonding: (15 Lectures)

Ionic bond: lattice energy, Born-Haber cycle, ionic solids: radius ratio rule and its limitations, ionic potential, polarizing power and polarisability, Fajan's rule.

Covalent bond: Basic concepts of valence bond theory and its limitations, resonance and resonance energy, hybridization involving s, p, d orbitals; sigma and pi-bonds, bond length, bond order, bond energy, formal charge, dipole moment, percentage of ionic character of covalent bond, VSEPR theory and its applications, LCAO-MO theory (qualitative) and its application to homo-nuclear diatomic molecules (H_2 , B_2 , C_2 , N_2 , O_2 , F_2); hydrogen bond, metallic bond (electron sea model and band theory).

B. i) Chemical equilibrium: (8 Lectures)

Reversible and irreversible reactions, law of mass action, derivation of expression for equilibrium constant for homogeneous and simple heterogeneous systems, temperature, pressure and concentration dependence on equilibrium state- La-Chatelier principle, simple application, inter relations hip between K_p , K_c and K_x , characteristic of the equilibrium state.

ii) Thermochemistry: (7 Lectures)

Exothermic and endothermic reactions; enthalpy (heat of formation, reaction, combustion, solution, neutralization, atomization, etc., laws of thermochemistry, bond dissociation energy, Born – Haber cycle.

Coordination Chemistry:

(15 lectures)

Werner's theory, IUPAC nomenclature, different types of ligands, multidentate ligands, coordination number and stereochemistry (up to coordination number 6); chelates, inner metallic complexes, types of isomerism in coordination compounds, bonding in coordination compounds: Valence Bond Theory (VBT).

Double Salts and their applications

Molecular Orbital Theory: H_2 , N_2 and O_2

Magnetochemistry:

(15 lectures)

Concept of diamagnetism, paramagnetism, ferromagnetism and antiferromagnetism, origin of paramagnetic moment: electron spin moment and orbital angular moment, magnetic susceptibility and magnetic moment; magnetic susceptibility measurement by Gouy methods.

B.Sc. Pass, Semester – II
Subject – Chemistry
Subject – Chemistry (Practical)
Paper – C1P2 (B)
Full Marks: 50 (40+10)
Time: 6 hours

A. Inorganic Practical: Marks : 24

Time: 4 hours

Experiment for 4 radicals	=16
Practical Note Book	=03
Viva-Voce	=05

Inorganic qualitative analysis:

Qualitative analysis of inorganic salt mixtures containing not more than four radicals from the following list:

Silver, lead, bismuth, copper, cadmium, arsenic, antimony, tin, iron, aluminium, chromium, manganese, cobalt, zinc, nickel, calcium, barium, strontium, magnesium, potassium, ammonium; chloride, bromide, iodide, sulphate, sulphide, sulphite, phosphate, borate, nitrate, nitrite, arsenate, oxides and hydroxides.

B. Organic Practical: Marks:16

Time:2 hours

Experiment : 10
Practical Note book : 03
Viva-voce : 03

Organic Preparation*:

Any one preparation is to be set in the practical examination.

Exp. No.	Experiment Titles
1.	Preparation of 7-hydroxy-4-methyl coumarin by Pechmann method
2.	Acetylation of aniline via green method
3.	Preparation of dibenzylidene acetone by condensation reaction.

*Identity of the product should be done by MP comparison with literature.

C. Internal assessment: Marks: 10

RECOMMENDED BOOKS

Organic Chemistry(Pass):

1. Organic Chemistry - I.L. Finar, Vol. I, 6th Edn. ELBS
2. Advanced Organic Chemistry - B.S. Bahl & A. Bahl, S. Chand
3. Advanced Organic Chemistry, Reactions & Mechanism – Mukherjee & Singh
4. Organic Chemistry - R.T. Morison & R.N. Boyd, Prentice – Hall.
5. Stereochemistry of Carbon Compounds - D. Nashipuri, John Wiley
6. Basic Stereochemistry of Organic Molecules - Subrata Sengupta, Book Syndicate
7. Advanced Organic Chemistry - N.K. Visnoi
8. Jaiba Rasayan - Subrata Sengupta, Book Syndicate.

Inorganic Chemistry(Pass):

1. Inorganic Chemistry Vol. I & II - R.L. Datta
2. Advanced Inorganic Chemistry Vol. I & II - Prakash, Tuli, Basu and Madan, S. Chand
3. Fundamental concepts of Inorganic Chemistry - A.K. Das
4. General and Inorganic Chemistry - R. P. Sarkar, Central...
5. General and inorganic chemistry - S.N. Podder & S.P. Ghosh

Physical Chemistry(Pass):

1. Bhouta Rasayan - N.N.Kundu, Vol. I & II
2. Essentials of Physical Chemistry - Bahl & Tuli, S. Chand
3. Bhouta Rasayan - P.C. Rakshit & P.R. Gupta, Sarat Book House.
4. Elementary Physical Chemistry - S.R. Palit, Syndicate Pvt. Ltd.

Practical Chemistry(Pass):

1. A Manual of Practical Chemistry (Vol. I & II) - R.C. Bhattacharjee
2. University hand book of undergraduate chemistry experiments – G.N. Mukherjee, University of Calcutta.
3. College practical chemistry - Ahluwalia, Dingra & Gulati.
4. Bebaharic Rasayan, Podder & Ghosh

B.Sc. Honours, Semester – II

Subject: Chemistry

Paper – H2, (A)

Marks:60 (48+12)

Unit-I: Inorganic Chemistry (Marks:24)

36 Lectures

- A. Acid-Base Concept:** Arrhenius and Bronsted-Lowry concept, the solvent-system concept (Franklin) and its limitations; Lewis concept; SHAB principle; pH and pOH scale; effect of solvent on relative strengths of acids and bases – leveling effect; Relative strengths of acids and bases (pK_a and pK_b concept).
- B. s-Block Elements:** Group discussion of the elements with respect to position in the periodic table: electronic configuration, atomic and ionic radii, ionization enthalpy, electron affinity (electron gain enthalpy), electronegativity, oxidation states, variation in properties of oxides and hydroxide, solvation and complexation tendencies of alkali and alkaline earth metals. Chemistry of lithium and beryllium their anomalous behavior and diagonal relationship.
- C. Noble Gas:** Preparation, properties and structure of xenon oxides, fluorides, oxyfluorides.
- D. p-Block Elements:** Group discussion of the elements with respect to position in the periodic table: electronic configuration, atomic and ionic radii, ionization enthalpy, electron affinity (electron gain enthalpy), electronegativity, oxidation states, variation of acidic and basic properties of their oxides and oxy-acids, inert pair effect and catenation.
- Preparation, properties and structure in the following compounds:** Diborane (with emphasis on bonding), Carbides, Hydrazine, hydroxylamine, hydrazoic acid, oxy acids of nitrogen, sulphur and halogens; per acids and salts of carbon and sulphur; interhalogen compounds, Pseudo-halogens, polyhalides, basic properties of Iodine. Sodium thiosulphate, Sodium dithionite, potassium iodide, boric acid, lithium aluminium hydride, lead tetraacetate.

Unit-II: Organic Chemistry; (Marks:24);

36 Lectures

A. Stereochemistry of organic compounds

Types of stereoisomers – configurational and conformational, enantiomers and diastereomers, geometrical and pi-diastereomers and their nomenclatures, difference in chemical and physical properties of pi-diastereomers, optical isomers, chirality, asymmetry, dissymmetry, R/S and D/L notations of optical isomers, racemic mixture and resolution.

Conformation: Conformational nomenclature ; eclipsed , staggered , gauche and anti ; dihedral angle , energy barrier of rotation , relative stability of conformers on the basis of steric effects, conformational analysis of ethane, n-butane, cyclohexane and monosubstituted cyclohexanes; stability of cycloalkanes-strains in rings, angle strain and torsional strain , Baeyer strain theory and its limitations. Asymmetric synthesis: stereospecific and stereoselective synthesis, regioselective synthesis, application of cram's rule, prelog's rule and Ahn-Felken rule.

B. Aromatic compounds

Aromaticity, non aromatic, antiaromatic, homoaromatic (benzenoid and nonbenzenoid). Preparation and properties of benzene, naphthalene, anthracene and phenanthrene.

C. Organic reaction mechanism in aromatic compounds

Electrophilic substitution in benzene (general mechanism): alkylation, acylation, halogenations, nitration, sulphonation. Synthesis and reactions of arenes, aromatic alcohols, aromatic halides, phenols, carbonyls, quinones, amines, nitrocompounds, carboxylic acids and name reactions of these compounds.

B.Sc. Honours, Semester – II

Subject: Chemistry

Paper – H2, (B)

Marks:40 (32+08)

Time: 6 hours

A. Inorganic Qualitative Analysis: Marks:32

Experiment for 5 radicals	=24
Practical Note Book	=03
Viva-Vocè	=05

[Qualitative analysis of mixtures of inorganic salts containing not more than five radicals (at least one interfering radical) from the following list]:

Basic Radicals: Silver, lead, bismuth, copper, cadmium, arsenic, antimony, tin, iron, aluminium, chromium, manganese, cobalt, zinc, nickel, calcium, barium, strontium, magnesium, potassium, ammonium.

Acid Radicals: fluoride, chloride, bromide, iodide, sulphate, sulphide, sulphite, phosphate, arsenite, arsenate, borate, nitrate, nitrite, ferrocyanide, ferricyanide, chromate, bromate, iodate, thiocyanate, silicate.

(Probable composition of the analyzed mixture be stressed upon)

B. Internal Assessment:

Marks:08

RECOMMENDED BOOKS

Organic Chemistry(Honours):

1. Organic Chemistry - I.L. Finar, Vol. I, 6th Edn. ELBS
2. Advanced Organic Chemistry - J. March
3. A guide to Organic Reaction Mechanism - P. Sykes, Orient Longman.
4. Organic Chemistry - R.T. Morrison & R.N. Boyd, Prentice – Hall.
5. Fundamentals of Organic Chemistry - Solomon
6. Organic Chemistry - Wade (Jr)
7. Stereochemistry of Carbon Compounds - E. Eliel.
8. Stereochemistry of Carbon Compounds - D. Nasipuri, John Wiley
9. Organic Spectroscopy - Y.R. Sharma
10. Organic Spectroscopy - W. Kemp
11. Organic Spectroscopy - P.S. Kalshi
12. Organic Reaction Mechanism - P.S. Kalsi
13. Organic Reaction mechanism - R.K. Bansal
14. Advanced Organic Organic hemistry - N.K. Visnoi
15. Advanced Practical Chemistry - R. Mukhopadhaya & P. Chatterjee.
16. Advanced Organic Chemistry – Miller
17. Organic Chemistry - Loudon

Inorganic Chemistry(Honours):

1. Basic Inorganic Chemistry - F.A. Cotton & G. Wilkinson & Gous
2. New concise Inorganic Chemistry - J.D. Lee
3. Inorganic Chemistry - Huheey, Keitar & Medhi
4. Selected topics in inorganic chemistry – Mallick, Tuli, Madan
5. Inorganic Chemistry - Sharpe
6. Inorganic Chemistry - W.W. Porterfield
7. Introduction to Modern Inorganic Chemistry - Mackay & Mackay
8. Elements of Bioinorganic Chemistry - G.N. Nukherjee & A. Das
9. Fundamental Concepts of Inorganic Chemistry-A.K. Das

Physical Chemistry(Honours):

1. Physical Chemistry - P.C. Rakshit
2. Physical Chemistry - P.W. Atkins
3. Physical Chemistry - G. W. Castellan
4. Physical Chemistry - S. Glastone
5. Physical Chemistry - Marron & Pruton/ Marron & Lando
6. Molecular Spectroscopy - Barrow
7. Molecular Spectroscopy - Banwell
8. Introductory Quantum Chemistry – A.K. Chandra, TATA McGraw Hill.
9. Quantum Chemistry – D.A. Mcquarrie, Viva Books, Pvt. Ltd.
10. Atomic Structure and Chemical Bonds – Manas Chandra
12. Programming in Basic –S. Gottfried
13. Programming in Basic –Balaguruswamy.

14. Statistical Methods – N.G. Das
15. J.O'M, Bockris and A.K.N. Reddy, *Modern Electrochemistry*, Vol.1&2 (1998). Plenum Press, New York.
16. P.W. Atkins and R.S.Friedman, *Molecular Quantum Mechanics*, 3rd Ed.(1997) Oxford University Press.
17. K.J.Laidler, *Chemical Kinetics*, 3rd Ed.(1967), Harper and Row Publishers, New York
18. H.Eyring, S.H. Lin and S.M.Lin, *Chemical Kinetics*, (1999) Jhon Willey, New York.

Practical Chemistry(Honours):

1. Vogel's Qualitative Inorganic Analysis - G. Svehla
2. Hand Book of Organic Analysis-qualitative & quantitative-H.T. Clarke
3. Qualitative Analysis - V. Alexeyev
4. University Hand Book of Undergraduate Chemistry Experiments, University of Calcutta-G.N. Mukherjee (ed)
5. College Practical Chemistry-V.K. Ahluwalia, S. Dhingra & A. Gulati
6. Text Book of Practical Organic Chemistry-A.I. Vogel
7. Vogels Text Book of Practical Organic Chemistry

Industrial Chemistry(Honours):

1. Industrial Chemistry, B.K. Sharma