



TRIPURA UNIVERSITY

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

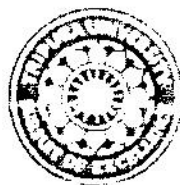
Syllabus

OF

**Chemistry
(Major & General)**

Semester – IV

2014



TRIPURA UNIVERSITY

(A Central University)
Suryamaninagar-799022

Syllabus

For

B.Sc. Pass Course

CHEMISTRY (Elective)
2014

STRUCTURE OF SYLLABUS:

1. In each course/paper of 80 marks shall be 4 distinct units.
2. In each of paper/course of 40 marks there shall be 2 distinct units.

DURATION OF EXAMINATION:

- | | | |
|--------------------------|---------|---------------------|
| 1. For paper of 80 marks | 5 hours | (General and Major) |
| 2. For paper of 40 marks | 2 hours | (General and Major) |

QUESTION PATTERN:

A. Papers/Course having forty (40) marks:-

1. Three (3) questions will be set from each unit out of which two (2) questions of 10 marks each are to be answered.
2. Each question of ten (10) marks may be subdivided into 2 to 3 marks having maximum of 5 marks for a part.

B. Papers/Course having eighty (80) marks:-

1. Three (3) questions will be set from each unit out of which two (2) questions of 10 marks each are to be answered.
2. Each question of ten (10) marks may be subdivided into 2 to 3 marks having maximum of 5 marks for a part.

C. Papers/Course having sixty (60) marks:-

1. Out of sixty (60) marks twelve (12) marks will be for Internal Assessment.
2. Remaining forty-eight (48) marks are to be divided into 2 units each of which will comprise twenty four (24) marks
3. In each of the aforesaid unit there will be three (3) questions out of which two (2) questions of twelve (12) marks each are to be answered.
4. Each question of twelve (12) marks may be subdivided into 2 to 3 marks having maximum of 5 marks for a part.

- D. There will be no MCQ type of questions in Honours papers and in case of General Courses the papers having practical component also there will be no MCQ type question.

B.Sc. SUBJECTWISE MARKS DISTRIBUTION

Semester	Paper	Marks	Semester	Paper	Marks
S1	C1P1	100	S2	C1P2	50+50(Pr)
	C2P1	100		C2P2	50+50(Pr)
	C3P1	100		C3P2	50+50(Pr)
	FNDC (English)	100		FN (MIL)+HIAC	100
S3	C1P3	50+50(Pr)	S4	C1P4	50+50(Pr)
	C2P3	50+50(Pr)		C2P4	50+50(Pr)
	C3P3	50+50(Pr)		C3P4	50+50(Pr)
	EVS	100		Computer Skill	
S5	C1P5	50+50(Pr)	S6	Project	100
	C2P5	50+50(Pr)		NER Studies	100
	C3P5	50+50(Pr)		Entrepreneurship	100
	Constitution of India & Planning	100		Development	
				Human Rights & Gender Studies	100

B.Sc. Honours

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI
Eng	MIL	EVS	Computer	H5	H7
C1P1	C1P2	C1P3[50+50(Pr)]	C1P4[50+50(Pr)]	H6[00(Pr)]	H8[100(Pr)]
C2P1	C2P2	C2P3[50+50(Pr)]	C2P4[50+50(Pr)]	Constitution & Planning	Project
H1(100)	H2[60+40(Pr)]	H3[60+40(Pr)]	H4[60+40(Pr)]	C1P5 [50+50(Pr)]	Human Rights & Gender Studies
				C2P5 [50+50(Pr)]	

SEMESTER WISE MARKS DISTRIBUTION

Semester	General Programme	Major Programme
I	400	400
II	400	400
III	400	400
IV	400	400
V	400	500
VI	400	500
Total (I to VI)	2400	2600

B.Sc. Pass, Semester – I,
Subject – Chemistry
Paper – C1P4 (A)
Full Marks: 50 (40+10)
Time: 2 hours

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

A. Synthetic applications of active methylene compounds and Grignard reagents:

10 Lectures

Synthesis and synthetic applications of diethyl malonate and ethylacetoacetate; Preparation and synthetic applications of Grignard reagents.

B. Heterocyclic compounds:

10 Lectures

Introduction to five and six membered heterocycles, nomenclature, aromatic character, structure, synthesis and chemical reactivity of furan, pyrrole, thiophene, pyridine and basicity of pyrrole and pyridine; Chemistry of indole and quinolone.

C. Carbohydrates:

10 Lectures

Introduction, classification, nomenclature, inter-relationship amongst monosaccharides, constitution of glucose and fructose, reactions of glucose and fructose, osazone formation, mutarotation and its mechanism, cyclic structures, pyranose and furanose forms.

Amino acids and Peptides: Introduction, alpha-amino acids – synthesis, physical and chemical properties, iso-electric points, peptide synthesis and determination of C and N terminal amino acid residues of peptides.

Unit-II Physical Chemistry (Marks:20)

30/01/2022

A. Electrical conduction through solution:

(6 Lectures)

Arrhenius theory of electrolytic dissociation, mode of transport of electricity through solution, transport number of ions, experimental method of determination of transport number –Hittorf's method, abnormal transport number, specific, equivalent and ionic conductances, ionic mobility, absolute velocity of ions, strong and weak electrolytes, Kohlrausch's law and its applications, measurement of conductance of solutions and applications. Solubility of sparingly soluble salts.

B. Ionic equilibrium:

(5 Lectures)

Ostwald dilution law, ionization of water, pH, buffer solution, buffer capacity, mechanism of buffer action, Henderson equation, hydrolysis of salts, common ion effect, solubility product, application of solubility product principle in analytical chemistry, ionic strength.

C. Electrochemical cells:

(4 Lectures)

Galvanic cells vis-à-vis electrolytic cells, reversible and irreversible cells, standard cells.

D. Physical properties and molecular constitution:

(5 Lectures)

Additive and constitutive properties – molar volume at boiling point, parachor, refractive index, molar refraction, optical activity, specific and molar rotation, dielectric constant, induced and orientation polarization, polar and non-polar molecules, dipole moment and its experimental methods of determination, Clausius-Mossotti equation (no derivation), ionic character of bonds.

E. Adsorption:

(5 Lectures)

Adsorption; types adsorption-Physical & Chemical adsorption; Freundlich and Langmuir isotherms, Surface Catalysis. Application of adsorption phenomenon in nature and industry.

F. Colloids:

(5 Lectures)

Preparation and purification of colloids, Lyophilic & Lyophobic Colloids properties of colloids – physical, mechanical (Brownian motion), optical (Tyndal effect), electrical (Zeta potential), stability of colloids; Hurdy – Schulze rule, Electro-kinetic Phenomena, micelles.

B.Sc. Pass, Semester - I,
Subject – Chemistry (Practical)
Paper – C1P4 (B)

Full Marks: 50 (40+10)

Time: 6 hours

A. Organic Practical; Marks : 20 Time :2 hours

Experiment:	12marks
Viva-voce:	03 marks
Lab. Note book:	05 marks

Organic Quantitative analysis:

Experiments to be performed

1. Estimation of aniline using brominating mixture
2. Estimation of glucose by Benedict reagent

B. Physical Practical; Marks : 20

Time :4 hours

Experiment:	12 marks
Laboratory note book:	03 marks
Viva-voce:	05 marks

List of the experiments which are to be performed by the students (at least three experiments are to be set in the examination and students are to be performed only one experiment):

1. Determination of the surface tension of a supplied liquid solvent/ solution by drop volume method.
2. Determination of the coefficient of viscosity of a given liquid/solvent using Oswald viscometer.
3. Determination of the partition coefficient of iodine between water and an organic solvent.

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):

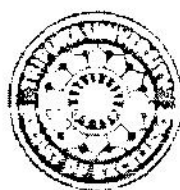
1. Inorganic Chemistry Vol. I & II - R.L. Datta
2. Advanced Inorganic Chemistry Vol. I & II - Prakash, Tuli, Basu and Madan, S. Chand
3. Fundamental concepts of Inorganic Chemistry - A.K. Das
4. General and Inorganic Chemistry - R. P. Sarkar, Central...
5. General and inorganic chemistry - S.N. Podder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



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S3	C1P3	50+50(Pr)	S4	C1P4	50+50(Pr)
	C2P3	50+50(Pr)		C2P4	50+50(Pr)
	C3P3	50+50(Pr)		C3P4	50+50(Pr)
	EVS	100		Computer Skill	
S5	C1P5	50+50(Pr)	S6	Project	100
	C2P5	50+50(Pr)		NER Studies	100
	C3P5	50+50(Pr)		Entrepreneurship Development	100
	Constitution of India & Planning	100		Human Rights & Gender Studies	100

B.Sc. Honours

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI
Eng	MIL	EVS	Computer	H5	H7
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C2P1	C2P2	C2P3[50+50(Pr)]	C2P4[50+50(Pr)]	Constitution & Planning	Project
H1(100)	H2[60+40(Pr)]	H3[60+40(Pr)]	H4[60+40(Pr)]	C1P5 [50+50(Pr)]	Human Rights & Gender Studies
				C2P5 [50+50(Pr)]	

SEMESTER WISE MARKS DISTRIBUTION

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III	400	400
IV	400	400
V	400	500
VI	400	500
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B.Sc. Honours, Semester – IV
Subject: Chemistry
Paper – H4, (A)
Marks:60 (48+12)
Time:2 hours

Unit-I: Organic Chemistry (Marks:24) 36 Lectures

A. Reactive intermediates: (12 lectures)

Carbocations, Carbanions, carbenes (electrophilic and nucleophilic), arynes and nitrenes – synthesis, stability, structure and reactivity.

B. Synthetic applications of active methylene compounds and organometallic reagents: 12 lectures

Synthesis and synthetic applications of diethyl malonate and ethyl acetoacetate; Preparation and synthetic applications of Grignard reagents, Organolithium and Organocopper reagents

C. Rearrangement reactions: (12 lectures)

Pinacol-pinacolone, Dienone-phenol, Wagner-Meerwein, Beckmann, Wolff, Hoffmann, Curtius, Lossen, Schmidt, benzil-benzilic acid, Favorskii, Fries and Claisen, Demjenov and Favorski rearrangement.

Unit-II: Physical Chemistry (Marks:24) 36 Lectures

A. Second law of thermodynamics: (8 Lectures)

Need for the law, spontaneous process, statements of second law, Carnot cycle, Carnot engine, efficiency of heat engine, concept of entropy, entropy change in simple systems, physical significance of entropy – entropy and probability. Gibb's free energy and Helmholtz free energy. Gibb's Helmholtz equation, thermodynamic criteria for spontaneity and equilibrium state of system. Nernst Heat Theorem – third law of thermodynamics (statement only).

B. Chemical equilibrium:

(8 Lectures)

Reversible and irreversible reactions, law of mass action, equilibrium constant, expression for equilibrium constants in various equations, thermodynamic derivation of law of mass action using free energy change and van't Hoff equilibrium box, Le Chatelier principle. Interrelationship between K_p , K_c and K_x , Reaction isotherm, reaction isochore, Van't Hoff equation, equilibrium in phases – Clapeyron equation, Clausius – Clapeyron equation.

C. Electrochemistry-I

(12 Lectures)

Electrical transport: Conductance of electricity through metals. Arrhenius theory of electrolytic dissociation; mode of transport of electricity through electrolytic solutions; transport number; experimental determination of transport number of ions by Hittorf's method and moving boundary method; abnormal transport number and causes thereto; measurement of conductance of solution; specific and equivalent conductance; ionic mobility; Kohlrausch law and its application; theory of strong electrolytes- Debye Huckel-Onsager equation (no derivation), ionic strength, Debye- Huckel limiting law (no derivation); activity and activity co-efficient; application of conductance measurements – conductometric titrations, solubility product of sparingly soluble salts

Ionic Equilibrium: Ostwald dilution law; ionization of water; ionic product of water; pH; buffer solution, buffer action and buffer capacity. Henderson equation, hydrolysis of salts, common ion effect, solubility product, - application of solubility product principle in analytical chemistry. Indicators – types, criteria for good indicators, theory of acid base indicators.

D. Phase equilibrium:

(8 Lectures)

Phase, component, degree of freedom, phase rule equation: $F = C - P + 2$ and its thermodynamic derivation. One Component Systems – water, carbon dioxide, sulphur system. Two Component Systems - salt solutions: KI – water; Fe_2Cl_6 – water systems, salt hydrate – $CuSO_4 \cdot 5H_2O$. Binary alloys: antimony – lead; aluminium – magnesium; gold – tin systems. Liquid – liquid mixture: Phenol – water, water – triethyl amine; water – nicotine; their miscibility; steam distillation, fractional crystallization; zone refining; partial miscibility of solid and liquid solutions. Thermal analysis, cooling curves, eutectic points, different alloys.

B.Sc. Honours, Semester – IV
Subject: Chemistry (Practical)
(Physical Chemistry)
Paper – H4, (B)
Marks:40 (32+08)
Time:4 hours

A. Physical Experiments: Marks:32

Experiment:	24 Marks
Laboratory Note Books :	03 Marks
Viva-voce:	05 Marks

The following experiments are to be performed by the students.

1. Determination of surface tension of a given liquid / solution with a stalagmometer by drop weight method.
2. Determination of viscosity coefficient of a given liquid / solution by Ostwald's viscometer.
3. Determination of distribution coefficient of iodine between water and an organic solvent.
4. Determination of distribution coefficient of an organic acid between water and an organic solvent.
5. Determination of pH of a buffer solution by colour matching of indicator.
6. Conductometric Titration of Strong Acid(HCl) vs Strong Base(NaOH)
7. Conductometric Titration of Weak Acid(CH₃COOH) vs Strong Base(NaOH)

All the experiments are equivalent. At least four experiments are to be set in the practical examination. Each candidate at the examination shall be assigned with one of these experiments through single draw lottery.

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 Chemistry - 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) John Wiley, 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