SILIGURI INSTITUTE OF TECHNOLOGY
DEPARTMENT O ENGINEERING
SCIENCES & ENGINEERING

COURSE FILE

1ST SEM, 1ST YEAR, 2023

SEC – E (ECE& EE)

PAPER DESCRIPTION: CHEMISTRY-I

PAPER CODE: BS-CH101

Course Handout for 1st Year B.TECH. PROGRAM

Course Title	: Chemistry 1
Course Code	: BS CH101/BS CH191
L-T-P Structure	: 3-1-3
Credits	: 5.5
Pre-requisite	: NA
Course Coordinator	: Dr. Susanta Kumar Saha
Team of Instructors	: Dr. Rabindranath Singha
Teaching Associates (For LAB only)	: Mr. Pankaj Sarkar & Mrs. Debalina Raha

Course Objective:

To impart knowledge on basic chemistry this will help students to establish their career in multidisciplinary area.

COURSE OUTCOMES (COs):

CO No	Course Outcome (CO)	Blooms Taxonomy Level (BTL)	Target %
CO1	Discuss microscopic chemistry in terms of atomic and molecular orbital and molecular spectroscopy.	1	60%
CO2	Rationalise bulk properties and processes using thermodynamicconsiderations; periodic properties such as ionization potential, oxidation states and electro negativity; and intermolecular forces.	2	60%
CO3	Demonstrate the organic reactions and stereo-chemistry of organic and coordinate compounds.	3	60%
CO4	Compute the data of quantitative chemical analysis and make use of simple model, equations to solve problems related to basic chemistry.	3	60%

PROGRAM OUTCOMES(POs):

PO Number	Description
1. Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.Problem Analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.Design/ development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6.The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.Lifelong learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CH201.1	1								1					
CH201.2	1	2							1			1	1	
CH201.3	1	2							1			1	1	
CH201.4	1	2							2			1	1	
CH201	1	2							2			1	1	

1 = courses in which the student will be exposed to a topic.
2 = courses in which students will gain competency in that area.
3= courses in which students will master that skill.

SYLLABUS:

(i) Atomic and molecular structure (12 lectures)
Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on bandstructures.

(ii) Spectroscopic techniques and applications (8 lectures)
Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

(iii) Intermolecular forces and potential energy surfaces (4 lectures)
Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

(iv) Use of free energy in chemical equilibria (6 lectures)
Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) Periodic properties (4 Lectures)
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

(vi) Stereochemistry (4 lectures)
Representations of 3 dimensional structures, structural isomers and stereoisomers,configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

(vii) Organic reactions and synthesis of a drug molecule (4 lectures)
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

TEXT BOOKS: Chemistry-1, by Gourkrishna Dasmohapatra.

REFERENCE BOOKS: 1. Inorganic Chemistry by J.D. Lee; 2. Organic Chemistry by Morrison &Byod; and 3. Physical Chemistry by P. C. Rakshit

COURSE DELIVERY PLAN:

Week	Sess. No.	CO	Topic (s)	Book No [CH No][Page No]	Teaching-Learning Methods	Planned Date	Execution Date
1	1	CO1	Atomic Structure, Schrodinger equation.	CH-1 Page 17-24	T: Chalk & Talk L: Observes understands	21.08.23	21.08.23
1	2	CO1	Particle in a box solution and their applications for simple sample.	CH-1 Page 38-44	T: Chalk & Talk L: Observes	22.08.23	22.08.23
1	3	CO1	Molecular orbitals of diatomic molecules (e.g.H2).	CH-1 Page 46-51	T: Lecturing L: Observes understands	22.08.23	22.08.23
2	4	CO1	Energy level diagrams of diatomic molecules.	CH-1 Page 52-55	T: Lecturing L: Observes understands	23.08.23	23.08.23
2	5	CO1	Pi-molecular orbitals of butadiene and benzene and aromaticity.	CH-1 Page 56-66	T: Lecturing L: Observes QUIZ	28.08.23	**28.08.23**
2	6	CO1	Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.	CH-1 Page 67 - 78	T: Chalk & Talk L: Observes understands	29.08.23	29.08.23
3	7	CO1	Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.	CH-1 Page 74 -80	T: Explain Monitoring L: Participates	29.08.23	29.08.24
3	8	CO1	Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.	CH-1 Page 80-86	T: Chalk & Talk L: Observes , understands	30.08.23	30.08.23
3	9	CO1	Band structure of solids and the role of doping on band structures.	CH-1 Page 88-90	T: Chalk & Talk L: Observes , understands	04.09.23	04.09.23
4	10	CO1	Band structure of solids and the role of doping on band structures.	CH-1 Page 90-92	T: Chalk & Talk L: Observes , understands, PBL	05.09.23	05.09.23
4	11	CO1	Principles of spectroscopy and selection rules.	CH-2 Page 103-117	T: Lecturing L: Problem based learning	05.09.23	05.09.23
4	12	CO1	Vibrational and rotational spectroscopy of diatomic molecules & applications.	CH-2 Page 119-141	T: Chalk & Talk L: Observes understands	06.09.23	06.09.23
5	13	CO1	Electronic spectroscopy.	CH-2 Page 144-154	T: Lecturing L: Observes understands	11.09.23	11.09.23
5	14	CO1	Fluorescence and its applications in medicine.	CH-2 Page 145-147	T: Chalk & Talk L: Observes understands	12.09.23	12.09.23
5	15	CO1	Nuclear magnetic resonance.	CH-2 Page 157-165	T: Chalk & Talk L: Observes understands	12.09.23	12.09.23
6	16	CO1	Surface characterisation techniques.	CH-2 Page 180-182	T: Chalk & Talk L: Observes	13.09.23	13.09.23
6	17	CO1	Diffraction and scattering	CH-2 Page	T: Chalk & Talk L:	18.09.23	20.09.23

				183 -188	Observes understands		
6	18	CO1	Magnetic resonance imaging.	CH-2 Page166-167	T: Chalk & Talk L: Observes understands	19.09.23	25.09.23
7	19	CO2	Ionic, dipolar and van der Waals interactions.	CH-3 Page 195-199	T: Chalk & Talk L: Observes , understands	19.09.23	26.09.23
7	20	CO2	Equations of state of real gases and critical phenomena.	CH-3 Page 195-199	T: Chalk & Talk L: Observes , understands	20.09.23	26.09.23
7	21	CO2	Equations of state of real gases and critical phenomena.	CH-3 Page 204-206	T: Chalk & Talk L: Observes , understands, PBL	25.09.23	27.09.23
8	22	CO2	Equations of state of real gases and critical phenomena.	CH-3 Page 206-209	T: Chalk & Talk L: Observes understands, QUIZ	26.09.23	03.10.23
8	23	CO2	Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations.	CH-5 Page 361-373	T: Chalk & Talk L: Observes understands	26.09.23	03.10.23
8	24	CO2	First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy.	CH-6 Page 231-244	T: demonstration, L: Practice by doing	27.09.23	04.10.23
9	25	CO2	Estimations of entropy and free energies.	CH-6 Page 266-278	T: demonstration, L: Practice by doing,	03.10.23	09.10.23
9	26	CO2	Free energy and emf.	CH-6 Page 278-299	T: Chalk & Talk L: Observes	03.10.23	10.10.23
9	27	CO2	Acid base, oxidation reduction and solubility equilibria.	CH-6 Page 294-299	T: Chalk & Talk L: Observes understands, Problem solving	04.10.23	10.10.23
10	28	CO2	Use of free energy considerations in metallurgy through Ellingham diagrams.	CH-6 Page 299-302	T: Lecturing L: Observes understands	09.10.23	11.10.23
10	29	CO2	Water chemistry.	CH-6 Page 302-331	T: Chalk & Talk L: Observes understands	10.10.23	16.10.23
10	30	CO2	Corrosion.	CH-6 Page 331-341	T: Chalk & Talk L: Observes understands	10.10.23	17.10.23
11	31	CO3	Atomic and ionic sizes, ionization energies, electron affinity and electronegativity.	CH-6 Page 373-398	T: Chalk & Talk L: Observes	11.10.23	17.10.23
11	32	CO3	Polarizability, oxidation states, coordination numbers and geometries.	CH-6 Page 398-412	T: Lecturing L: Observes	16.10.23	18.10.23
11	33	CO3	Hard soft acids and bases, molecular geometries.	CH-6 Page 412-417	T: Lecturing L: Problem based learning	17.10.23	30.10.23
12	34	CO3	Representations of 3 dimensional structures, structural isomers and stereoisomer.	CH-6 Page 417-424	T: Chalk & Talk L: Observes understands	17.10.23	31.10.23

12	35	CO3	Configurations and symmetry and chirality, enantiomers, diastereomers.	CH-6 Page 425- 433	T: Lecturing L: Observes understands	18.10.23	31.10.23
12	36	CO3	Optical activity, absolute configurations and conformational analysis.	CH-6 Page 433-446	T: LecturingL: Observes understands	25.10.23	01.11.23
13	37	CO3	Isomerism in transitional metal compounds.	CH-6 Page 447-551	T: Questioning /Discussion, L: PBL	30.10.23	06.11.23
13	38	CO3	First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy.	CH-6, Page 244-266	T: demonstration, L: Practice by doing	31.10.23	07.11.23
13	39	CO3	Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	CH-7 Page-453-461	T: Chalk & Talk L: Observes understands	31.10.23	07.11.23
14	40	CO3	Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	CH-7 Page-461-473	T:Questioning /Discussion L: Answering questions, Participates	01.11.23	08.11.23
14	41	CO3	Synthesis of a commonly used drug molecule.	CH-7 Page 510-515	T: LecturingL: Observes understands	06.11.23	20.11.23
14	42	CO3	Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	CH-7 Page-489-510	T: Chalk & TalkL: Observes understands	07.11.23	21.11.23

LIST OF TUTORIALS:

Tutorial session no	Topics	CO-Mapping
Tutorial 1	Discussions on pre-requisite of the syllabus.	CO1
Tutorial 2	Question answer discussion on atomic orbital theory and numerical problems.	CO1
Tutorial 3	Question answer discussion on molecular orbital theory and numerical problems.	CO1
Tutorial 4	Question answer discussion on basics of crystal field theory and numerical problems.	CO1
Tutorial 5	Question answer discussion on Spectroscopy.	CO1
Tutorial 6	Question answer discussion on selection rule.	CO1
Tutorial 7	Problems related to 1st law of thermodynamics. Entropy, free energy.	CO2
Tutorial 8	Problems related to electrolysis and electrochemical cell and numerical problems.	CO2
Tutorial 9	Question answer discussions on the basics of water chemistry and corrosion.	CO2
Tutorial 10	Question answer discussions on periodic properties.	CO2
Tutorial 11	Problems related to real gasequation.	CO2
Tutorial 12	Question answer discussions on Stereochemistry.	CO3
Tutorial 13	Question answer discussions on organic chemistry and organic conversions.	CO3
Tutorial 14	Discussion on University Question papers.	

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDEDED PROBLEM-SOLVING EXERCISES etc.

Week	Assignment/Quiz	Topic	Details	CO
2	A01	Organic Reactions	Nomenclature and mechanism.	Pre requisite
4	A02	Stereochemistry	Stereoisomerism: Geometrical Isomerism & Optical Isomerism	CO1
6	A03	Thermodynamics	Basic principles & applications.	CO2
9	A04	Molecular Spectroscopy	Classification & applications.	CO3
12	A05	Atomic & Molecular Structure	Concept of Atomic orbital & Molecular orbital.	CO4

COURSE TIME TABLE:

Lecture for section E:

Days	Timing
Monday	11:40 A.M to 12:30 P.M.
Tuesday	10:00 A.M. to 11:40 A.M.
Wednesday	12:30 P.M. to 13:20 P.M.

Tutorial for Section E:

Days	Timing
Tuesday	15:00 P.M. to 15:50 P.M.

Lab for section E:

Days	Timing
Monday	13:20 P.M. to 16:40 P.M.

REMEDIAL CLASSES:

Supplement course handout, which may perhaps include special lectures and discussions that would be planned, and schedule notified accordingly.

EVALUATION: AS PER MAKAUT GUIDELINES

Schedule for Continuous Assessment (CA):

CA	Assessment By	Schedule
CA-I	Presentation, Quiz, Group Discussion	As per Academic Calendar
CA-II	Report writing	
CA-III	Class test in pen and paper mode to be conducted at the College Level	
CA-IV	Centralized online test to be arranged by theUniversity	
PCA1	Rubrics based Evaluation and Viva -Voce	
PCA2	Rubrics based Evaluation and Viva -Voce	

ATTENDANCE POLICY

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfil all other tasks assigned to him/her in every course. For Promotion, a Minimum of 50% of internal marks must be obtained. In every course, student has to maintain a minimum of 75% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 60% to 75% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments.

DETENTION POLICY

In any course, a student has to maintain a minimum of75% attendance and must secure a minimum of 50% marks in In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY

Use of unfair means in any of the evaluation components will be dealt with strictly, and the case will be reported to the examination committee.

COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:

Each instructor will specify his / her chamber consultation hours during which the student can contact him / her in his / her chamber for consultation.

S.No.	Name of Faculty	Chamber Consultation Day (s)	Chamber Consultation Timings for each day	Chamber Consultation Room No:	Signature of Course faculty
1	Dr. S. K. Saha	Monday, Friday	1:30 pm to 2:10 pm	D-004	
2	Dr. R. Singha	Tuesday, Thursday	1:30 pm to 2:10 pm	D-004	

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

All notices will be communicated through the institution email.
All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR: Dr Saha 17/8/2023

HEAD OF DEPARTMENT:

22.08.23

Approval from: Head of the Institutions
(Sign with Office Seal)

Principal
Sikkim Institute of Technology

SILIGURI INSTITUTE OF TECHNOLOGY

Academic & Institutional Activity Calendar for the Odd Semester 2023 (College Code119)

Sl No.	Event/Activity	Start Date	End Date
1	Commencement of Academic Programs (3rd, 5th, 7th Sem)	15.07.2023	
2	Enrollment of students (3rd, 5th, 7th Sem)	20.07.2023	29.07.2023
3	Bridge Course for newly admitted students of B. Tech 1st Sem	As per admission dates	
4	Commencement and enrollment of students of 1st Sem	As per admission dates	
5	Induction Programme for newly admitted students of B. Tech 1st Sem	As notified by MAKAUT	
6	7th Sem (FSP)	Last week of July 2023	
7	7th Sem (Technical)	August 2023	
8	5th Sem (Technical)	August 2023	
9	3rd sem(Technical)	August 2023	
10	MAR upload by the college	1.08.2023	31.12.2023
11	Detailed information submission related to MOOCs by MOOC Coordinator to Academic coordinator (3rd, 5th, 7th Sem)	2.08.2023	
12	MOOCs upload by the students and verification by the college for Honours cases	01.08.2023	31.05.2024
13	MOOCs record for credit transfer	Within the end sem exams	
14	Students' formative feedback & submission of ATR (3rd, 5th, 7th Sem)	07.08.2023	10.08.2023
15	Submission of Syllabus Progress Report (1st Set) (3rd, 5th, 7th Sem)	10.08.2023	
16	Submission of CA1 (all odd semesters)	11.08.2023	14.08.2023
17	Celebration of Independence day	15.08.2023	
18	Mentor Mentee Meeting – I	16.8.2023	18.8.2023
19	Students' formative feedback & submission of ATR (1st Sem)	04.09.2023	08.09.2023
20	Submission of Syllabus Progress Report (2nd Set) (3rd, 5th, 7th Sem)	08.09.2023	
21	Principal's Meeting with Class Representatives (1st Mee) (3rd, 5th, 7th Sem)	11.09.2023	13.09.2023
22	Submission of CA2 & PCA1 (all odd semesters)	11.09.2023	14.09.2023
23	Detailed information submission related to MOOCs by MOOC Coordinator to Academic coordinator (1st Sem)	15.09.2023	
24	Celebration of Biswakarma Puja	18.09.2023	
25	Written Examination for CA3	03.10.2023	06.10.2023
26	Submission of Syllabus Progress Report (1st Set) (1st Sem)	06.10.2023	
27	Principal's Meeting with Class Representatives (1st Meeting) (1st Sem)	09.10.2023	
28	Submission of CA3 (all odd semesters)	09.10.2023	13.10.2023
29	Submission of Syllabus Progress Report (3rd Set) (3rd, 5th, 7th Sem)	10.10.2023	
30	Parent Teacher Meeting;	01.11.2023	03.11.2023
31	Online Test for CA4	As notified by MAKAUT	
32	1st sem(Technical)	November 2023	
33	Submission of CA4 & PCA2	06.11.2023	10.11.2023
34	Submission of Syllabus Progress Report (4th Set) (3rd, 5th, 7th Sem)	06.11.2023	
35	Principal's Meeting with Class Representatives (2nd Meeting) (3rd, 5th, 7th Sem)	06.11.2023	08.11.2023
36	Mentor Mentee Meeting – II	06.11.2023	08.11.2023
37	Pre Examination activities (Form fill-up etc)	17.11.2023	25.11.2023
38	Submission of Syllabus Progress Report (2nd Set) (1st Sem)	21.11.2023	
39	Principal's Meeting with Class Representatives (2nd Meeting) (1st Sem)	23.11.2023	
40	Teaching ends	23.11.2023	
41	Student's feedback Summative (3rd, 5th, 7th Sem)	22.11.2023	24.11.2023
42	Practical , Sessional and Viva-voce examinations and marks submission	28.11.2023	02.12.2023
43	Student's feedback Summative (1 Sem)	30.11.2023	02.12.2023
44	Theory Examinations	04.12.2023	22.12.2023
45	Detailed information submission related to MAR by MAR Coordinator to Academic coordinator (All Sems)	15.12.2023	
46	Publication of results	As notified by MAKAUT	

N.B. The academic calendar for odd semester 2023 (College Code 119) is subject to modification as per the directive/notification of MAKAUT, WB and appropriate authority.

21.06.2023

Mamta Saha (Academic Coordinator, College Code 119)

Approved for circulation
21.06.23

Siliguri Institute of Technology

Model Holiday List - 2023

Date	No. of day	Day	Particulars
12th January	1	Thursday	B...th Day of Swami Vivekanand
23rd January (To be celebrated)	1	Monday	B...thday of Netaji
26th January (To be celebrated)	1	Thursday	Republic Day/ Saraswati Puja
7th March	1	Tuesday	Dolyatra
8th March	1	Wednesday	Holi
14th April	1	Friday	Birthday of Dr. B. R. Ambedkar
15th April	1	Saturday	Bengali New Year Day
22nd April	1	Saturday	Ed-Ul-Fitr
1st May	1	Monday	May Day
5th May	1	Friday	Buddha Purnima(For Buddhist only)
9th May (To be celebrated)	1	Tuesday	Birthday of Rabindranath Tagore
29th June	1	Thursday	Id-Ul-Zoha
13th July	1	Thursday	Birthday of Poet Bhanu Bhakt
29th July	1	Saturday	Muharram
15th August (To be celebrated)	1	Tuesday	Independence Day
2nd October	1	Monday	Birthday of Gandhiji
14th October	1	Saturday	Mahalaya
21st October to 24th October	4	Saturday to Tuesday	Durga Puja vacation (Saptami to Vijaya Dashami)
28th October	1	Saturday	Laxmi Puja
12th November	1	Sunday	Kali Puja
15th November	1	Wednesday	Bhatridwitya
19th November	1	Sunday	Chhat Puja
27th November	1	Monday	Birth Day of Guru Nanak (For Sikhs only)
25th December	1	Monday	Christmas Day

Total Numbers of Holidays for Colleges = 18 days (Excluding 09 Saturday & Sundays) for the year of 2023

** Netaji's Birthday (23rd January), Republic Day (26th January), Rabindra Nath Tagore's Birthday (1st May) and Independence Day (15th August) are usually celebrated in the respective units in presence of all Teaching & Non-Teaching Staff members. In the year 2023, the mode of celebration will be decided by the respective Head of the Unit considering the impact of Covid Pandemic.

...ugh this is a Model Holiday List for the year 2023, the same may be altered with due permission of the Competent Authority but the total effective no. of holiday, must not exceed 18 Days for the year 2023.

GENERAL GUIDELINES TO BE FOLLOWED

1. If any working day is lost due to General Strike or any other disruption of work then college will remain open on any of the week's off day.
2. For exigencies of work the reporting officer is authorized to call concerned Faculty /Staff member to report to duty on the listed holidays and in such case he/she will take compulsory off day in any of the working days with the approval of reporting officer.
3. Apart from the above listed holidays the Director/ Principal in charge are authorized to declare 2 (Two) Holidays depending upon need and sentiment of the institutions. For any kind of additional Holiday the Head of the Institution will have to take prior written approval of the member trustee with justification.
4. Holidays indicated above, are subject to change by the Competent Authority, due to the prevailing pandemic situation, as and when required.
5. The following days are declared as Sectional Holidays in the year 2023 for the employees & students of different communities mentioned against each:-
   A) Buddha Purnima – For Buddhist Only
   B) Birthday of Guru Nanak – For Sikh Only

For Circulation

Principal, SIT 23/12/22

SILIGURI INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ENGINEERING SCIENCES AND HUMANITIES

B. TECH 1ST YEAR 1ST SEMESTER ROUTINE 2023 , SECTION -E

Day	Department	10:00-10:50	10:50-11:40	11:40-12:30	12:30-1:20	1:20-2:10	2:10-3:00	3:00-3:50	3:50-4:40
MON	ECE	MOOCS(Soft Skills)(RC)	Collaborative Activity(PB)	ES-CH101 (SKS/RS)		BS-CH191			
	CE								
TUE	ECE	BS-CH101(SKS/RS)	BS-CH101(SKS/RS)	AUTOCAD (PB) (ROOM-DESIGN LAB)	Aptitude Class (Pratik Sharma)	LUNCH	BS-M102 (JD)	BS-CH101(T)(R-D202)	LIBRARY HOUR
	EE								
WED	ECE	BS-CH101(SKS/RS) (ROOM-D202)	Departmental Hands-on ECE (D-202)	Collaborative Activity(PS)	CLUB ACTIVITY	LUNCH	BS-M102(JD)(T)	ES-EE101(SP)	ES-EE101(SP)
	EE		Departmental Hands-on EE (D-101)						
THU	ECE	MOOCS(ETHICS) (RC)	ES-EE191		ES-EE101(SP)(T)	LUNCH	BS-M102(JD)	ES-EE191 LAB WORKS (SP)	Collaborative Activity(RC)
	EE								
FRI	ECE	ES-ME191			AUTOCAD(PB) (ROOM-DESIGN LAB)	LUNCH	BS-M102(JD)	ES-EE101(SP)	Games & Sports / Yoga
	EE								

Course Code : BS-CH101/ BS-CH201	**Category :** Basic Science Courses
Course Title : Chemistry-I	**Semester** : First/ Second
L-T-P : 3-1-0	**Credit:4**
Pre-Requisites:	

Detailed contents

i) Atomic and molecular structure (10 lectures)

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H_2). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

ii) Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

iii)Intermolecular *forces and potential energy surfaces (4 lectures)*

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

iv) Use of free energy in chemical equilibria (8 lectures)

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

v) Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

vi)* Stereochemistry *(4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

vii)* Organic *reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

Learning Resources:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
7. Physical Chemistry, P. C. Rakshit, Sarat Book House
8. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BS-CH101/BSCH101 Chemistry I(Gr B)

UPID : I001034

Time Allotted : 3 Hours | Full Marks :70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

[1 x 10 = 10]

1. Answer any ten of the following :
   - (i) Write name of a molecule which have infrared active vibrations.
   - (ii) The strength of van der Waals forces depends upon which factor?
   - (iii) Write one process where entropy decreases.
   - (iv) What is the shape of XeF_4 molecule?
   - (v) For n – butane which type of conformation is the least stable?
   - (vi) In SN1 type reaction which type of solvent is used?
   - (vii) If uncertainty in position and momentum are equal then what will be the uncertainty in velocity?
   - (viii) Which is detected by IR spectra?
   - (ix) Which interaction is the strongest interaction?
   - (x) What is the internal energy change for a cyclic process?
   - (xi) Write the increasing order of effective nuclear charge in Na, Al, Mg and Si?
   - (xii) Give one example of ambidentate ligand.

Group-B (Short Answer Type Question)

Answer *any three* of the following : [5 x 3 = 15]

2. Define Van der Waals forces. Discuss their nature. [5]
3. (a) Explain the term chemical potential.
   (b) Derive the relation of EMF of cell with ΔG and ΔH. [5]
4. State the reason for the presence of only one electron in the 4s subshell of chromium?
   Which of the following has larger size and why? (i) Mg^{2+} (ii) N^{3-} [5]
5. (a) Distinguish between constitutional isomers and stereo isomers.
   (b) What is chirality?
   (c) Does presence of two chiral carbon atoms always make the molecule optically active? Explain. [5]
6. 'All adiabatic reversions lead to a fall of temperature.' – Comment or justify.

Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

7. (a) Phenol on treatment with Br_2 in CS_2 at low teamperature gives two isomeric monobromophenols X and Y. But phenol on treatment with bromine water gives a white precipitate Z. Identify the products X, Y and Z with chemical reactions. [6]
   (b) What do you mean by enantiomer and diastereomer? Differentiate them with examples. [4]
   (c) Explain the difference between a meso – isomer and a recimic mixture. What characteristics do they have in compound? [5]
8. (a) Draw the π– molecular orbital diagram of Benzene. Predict whether the following compounds are aromatic, anti – aromatic or anti – aromatic: (i) Furan (ii) Cyclopentadienyl cation. [5]
   (b) Write notes on Synthesis of paracetamol. [5]
   (c) Nitration is also in absence of H_2SO_4 yet H_2SO_4 has no effect on benzene under the conditions employed. Show the mechanism of nitration of benzene. [5]
9. (a) Set up the Schrodinger equation for a partical in a one - dimensional box. [5]
   (b) Show how the model of particle in a box can be applied to calculate the energy spectra of polyene. [4]
   (c) What is zero point energy of a particle in one dimensional box? Why the energy of this particle cannot be zero at zero point energy? If the zero point energy of the particle in one dimensional box [6]

eV, what is the next higher energy value?

What is the difference between ionization energy and election affinity? The first ionization energy of carbon is greater than that of boron whereas the reverse is true for the second ionization energy. [5]

(b) Why does Mn (II) is $3d^5$? Would you classify Zn as a transition element? Give reasons for your answer. [5]

(c) Expain that ionisation energy of neon is more than any other element of the second period? Why do the transition elements from complexes readily? [3]

11 (a) What would have happened to the gas if the molecular collisions were not elastic? [3]

(b) CO_2 is heavier then O_2 and N_2 gases present inthe air but it does not form the lower layer of the atmosphere. Why? [3]

(c) Why in case of hydrogen and helium, the compressibility factor is always greater than 1 and increases with increase in pressure? [3]

(d) Why gases can be liquefied by cooling? [3]

(e) Which type of liquids will have higher boiling points? 'Polar or Non – polar liquids" – Give reason for your answer

*** END OF PAPER ***

SILIGURI INSTITUTE OF TECHNOLOGY

CA3 Examination -2023

B. Tech. (EE & ECE) 1ST Year 1st Semester

Subject: Chemistry - 1 Full Marks – 25

Paper Code: BS CH101 Time – 1 hr

I. Answer *any five* of the following questions (objective): (CO 1) 1 x 5 = 5

(i) Write the unit of van der Waals constant 'a'.

(ii) Define Gibbs free energy with relevant equation.

(iii) What is the cause of temporary hardness of water?

(iv) Write the name of natural elements with highest and lowest electronegativity.

(v) Give an example of geometrical isomerism.

(vi) What is Markovnikov's rule? Give one example.

(vii) Which products will be formed after ozonolysis of propene?

II. Answer *any four* of the following questions: (CO 2) 5 x 4 = 20

2. What is IR spectroscopy? What are the various types of molecular vibrations associated with the IR region? What is finger print region in IR spectra? What is chromophore and auxochrome? Mention its importance.

3. What is Carnot cycle? Derive the equation of efficiency of Carnot engine using the concept of thermodynamics. For a reaction both ΔH and ΔS are positive. Under what conditions will the reaction be spontaneous?

4. Draw figure to show the splitting of d orbitals in an octahedral crystal field. $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic. Explain. Explain enantiomers and *cis-trans* isomers with examples.

5. Explain the terms band gap, valence band and conduction band with diagram. Classify the semiconductors with examples. Give molecular orbital energy level diagram of N_2. Write its electronic configuration, magnetic behaviour and bond order.

6. Explain the following reactions with a suitable example. (i) Ozonolysis, (ii) SN1 and SN2 Reaction.

7. What is screening constant? Calculate the effective nuclear charge (Z_{eff}) of one 4s electron of the following: i) Cu (Z=29) and K (Z=19). Write the Nernst equation for the cell reaction in the Daniel cell.

11901623001

20/25

Name: Aditya Chauhan
Roll: 03 Sec: E Group: E-E
Sub: Chemistry Course: CH 101

I.

i. $atm\ L^2\ mol^2$

ii. Gibbs Free Energy is given by:- 1
$\Delta G = \Delta T + \Delta S$. ? ✗ 0

iii. Na_2CO_3 ~~(Sodium)~~
Presence of Sodium bicarbonate 1

iv. F^- (Fluorine has the ~~lowest~~ Highest Electronegativity) 1/2
Cl^- (chlorine) has the lowest Electronegativity)

v. Markovnikov's rule states that in an alkene the halogen atoms are removed (Cl^-, Br^-) and there will be addition of hydrogen. ✗ 0

For eg.

$$CH_3 - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3 \xrightarrow{\text{Markonikovs rule.}} CH_3 - CH_2 = CH_2$$

vi. propene-2-ene ✗ and propene-2-yne 0

2.

i. IR Spectroscopy (Infrared spectroscopy) is a technique which analyzes the interaction of atomic molecules with infrared radiation.

05/25 +3=10 Scale

VAIBHAV GUPTA
01 E EE
CHEMISTRY BS-CH101

16/11/24

I

$V_c = 36$

$P_c = \frac{a}{27b^2}$

atm L^2 = a

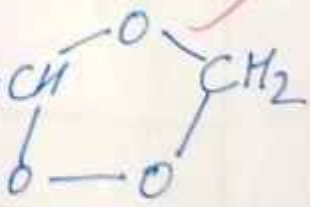
(i) atm L^2

(iv) highest electronegativity
⇒ Flourine
lowest electronegativity
⇒ Rubedium

(vi) It is the reaction in which X-Hydrogen is replaced by Halogen in dark.

e.g. $CH_3COCH_3 \xrightarrow[\text{dark}]{Cl_2} CH_2Cl-CO-CH_2Cl$ (−HCl)

(vii) ~~$CH_2=CH$~~
~~$C\equiv C-C=C$~~

$CH_3-CH=CH_2 \xrightarrow{O_3}$ 

(V) CH_3COCH_3 propanone & CH_3CH_2CHO ethanal

Assignment

On

Chemistry

NAME : PALLAVI SONAR
DEPT : ECE
SEC : E
ROLL.NO : 20

TOPIC : Atomic & Molecular Structure

SUBTOPICS :-

i) De Broglie Equation
ii) Heisenberg Uncertainity Principle
iii) Derivation of Schrodinger Equation
iv) Pi Molecular Orbital of Butadiene & Benzene
v) Aromaticity of Benzene

De Broglie Equation :-

The wave nature of light was the only aspect that was considered until Neil Bohr's model. Later, however, Max Plank in his explanation of quantum theory hypothesized that light is made of very minute pockets of energy which are in turn made of photons or quanta. It was then considered that light has a particle nature and every packet of light always emits a certain fixed amount of energy. Louis de Broglie was a student of Bohr who then formulated his own hypothesis of wave-particle duality, drawn from this understanding of light. Later on, when this hypothesis was proven true, it became a very important topic in particle physics.

Quantum mechanics assumes matter to be both like wave as well as a particle at the sub-atomic level. The De Broglie equation states that every particle that can move sometimes act as a wave and sometimes as a particle. The wave which is associated with the particles that are moving are known as the matter-wave and also as the De Broglie wave. The wavelength is known as the de Broglie wavelength.
For an electron, De Broglie wavelength equation is :

$$\lambda = \frac{h}{mv}$$

Here, λ points to the wave of the electron
m is the mass of the electron
v is the velocity of the electron
mv is the momentum that is formed as a result
It was found out that this equation works and applies to every form of matter in the universe i.e, Everything in this universe from living beings to inanimate objects all have wave particle duality.

Heisenberg's Uncertainty Principle

Heisenberg's Uncertainty principle states that for particles exhibiting both particle and wave nature, it will not be possible to accurately determine both the position and velocity at the same time. The principle is named after German physicist Werner Heisenberg, who proposed the uncertainty principle in the year 1927. This principle was formulated when Heisenberg was trying to build an intuitive model of quantum physics. He discovered that there were certain fundamental factors that limited our actions in knowing certain qualities.
This principle basically highlights that simultaneous measurement of position and the velocity of momentum of microscopy matter waves will have an error such that the product of the error in measurement of position and momentum is equal or more than an integral multiple of a constant.

Formula and Application :-
If Δx is the error in position measurement and Δp is the error in the measurement of momentum, then

$$\Delta x \times \Delta p \geq \frac{h}{4\pi}$$

Since, momentum $p = mv$, Heinsberg's uncertainty principle formula can be alternatively written as,

$$\Delta x \times \Delta mv \geq \frac{h}{4\pi}$$

or,

$$\Delta x \times \Delta m \times \Delta v \geq \frac{h}{4\pi}$$

where, ΔV is the error in the measurement of velocity and assuming mass remains constant during the experiment.

$$\Delta x \times \Delta v \geq \frac{h}{4\pi}$$

Accurate measurement of position or momentum automatically indicates larger uncertainty (error) in the measurement of the other quantity.

Applying the Heisenberg principle to an electron in an orbit of an atom, with $h = 6.626 \times 10^{-34}$ Js and $m = 9.11 \times 10^{-31}$ kg.

$$\Delta x \times \Delta v \geq \frac{6.626 \times 10^{-34}}{4 \times 3.14 \times 9.11 \times 10^{-31}} = 10^{-4}\ m^2$$

If the position of the electron is measured accurately to its size (10^{-10} m), then the error in the measurement of its velocity will be equal to or larger than 10^6 m or 1000 km.

Heisenberg's principle applies to only dual-natured microscopic particles and not to macroscopic particles whose wave nature is minimal.

CHEMISTRY ASSIGNMENT

NAME :- ADITYA CHAUHAN.

ROLL NO. :- 03

DEPARTMENT :- E.E

SECTION :- E.

TOPIC :-

TYPES OF ISOMERISM.

NAME: VAIBHAV GUPTA

DEPT: EE SECTION: E

ROLL N.O: 01

TYPES OF ISOMERISM:

ISOMERS

1)STRUCTURAL-ISOMERISM

2)STEREO-ISOMERISM

STRUCTURAL ISOMERISM:

i)Chain isomerism

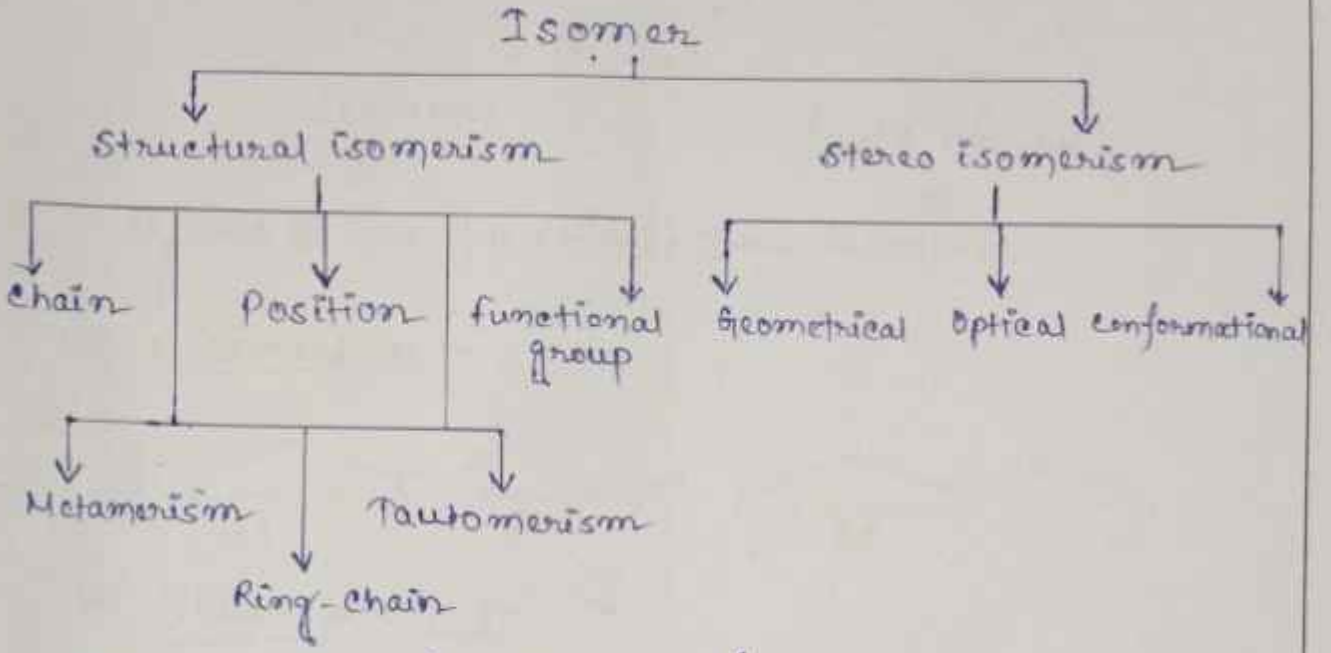
ii)Position isomerism

iii)Functional isomerism

iv)Metamerism

Name – Ankan Guha Roy
Dept – ECE, Sem – 1st
Sub – Chemistry

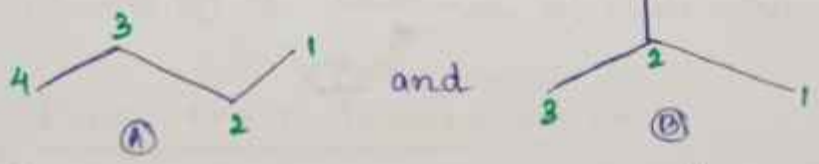
Q] Give one example of each type of isomerism.



The examples of each type of isomers are described below :-

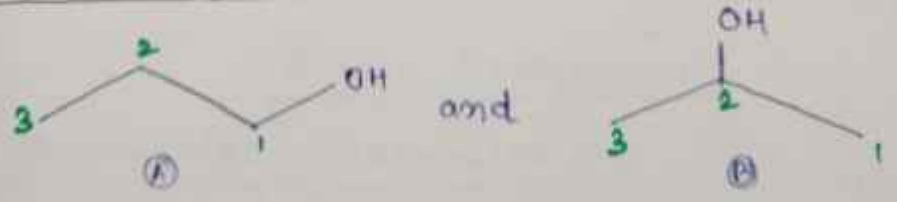
Structural Isomerism

(i) **Chain Isomerism :-**



(A) and (B) are chain isomers of each other.

(ii) **Position Isomerism :-**



(A) and (B) are position isomers of each other.