

B. Sc. CHEMISTRY
SYLLABUS - 2014

SCHOOLS OF EXCELLENCE
with
CHOICE BASED CREDIT SYSTEM (CBCS)



SCHOOL OF PHYSICAL SCIENCES
St. JOSEPH'S COLLEGE (Autonomous)

Accredited at 'A' Grade (3rd Cycle) by NAAC
College with Potential for Excellence by UGC
TIRUCHIRAPPALLI - 620 002, INDIA

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

POST GRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to work towards the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from this academic year 2014 – 15, to standup to the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system allows the enhanced academic mobility and enriched employability of the students. At the same time this system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student centric in curriculum designing and skill imparting. These five schools will work concertedly to achieve and accomplish the following objectives.

- Optimal utilization of resources both human and material for the academic flexibility leading to excellence.
- Students experience or enjoy their choice of courses and credits for their horizontal mobility.
- The existing curricular structure as specified by TANSCH and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.
- Human excellence in specialized areas
- Thrust in internship and / or projects as a lead towards research and
- The **multi-discipline** nature of the newly evolved structure (School System) caters to the needs of stake-holders, especially the employers.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For UG courses, a student must earn a minimum of 150 credits as mentioned in the table below. The total number of minimum courses offered by a department are given in the course pattern.

SUMMARY OF HOURS AND CREDITS UG COURSES - CHEMISTRY

Part	Semester	Specification	No. of Courses	Hours	Credits	Total Credits
I	I-IV	Languages (Tamil/Hindi/French/Sanskrit)	4	16	12	12
II	I-IV	General English	4	20	12	12
III	I-VI	Core Theory Practicals Internship & Project Work Comprehensive Exam	17	90	69	98
		Core Electives	3	12	11	
		Allied	4	24	18	
		Additional Core Courses for Extra Credits	-	-	-	
IV	V-VI	Skilled Based Electives Between Schools (BS) Within School (WS)	1 1	2 2	2 2	4
		Inter Departmental Courses (IDC) - Soft Skills	1	2	2	2
	I-IV	NMC Communicative English Computer Literacy	1 1	0 2	5 2	7
		Environmental Studies	1	2	2	2
		Value Education	4	8	8	8
V	I-V	SHEPHERD & Gender Studies	1	-	5	5
	I-V	AICUF, Fine Arts, Nature Club, NCC & NSS				
TOTAL				180		150

Course Pattern

The Under Graduate degree course consists of Five vital components. They are as follows:

Part-I : Languages (Tamil / Hindi / French / Sanskrit)

Part-II : General English

Part-III : Core Course

(Theory, Practical, Core Electives, Allied, Project, Internship and Comprehensive Examinations)

Part-IV : SBE, NMC, Value Education, Soft Skills & EVS

Part-V : SHEPHERD, AICUF, Finearts, Nature Club, NCC, NSS, etc.

Non-Major Courses (NMC)

There are three NMC's – Communicative English, Computer Literacy and Environmental Studies offered in the I, II & III Semesters respectively.

Value Education Courses:

There are four courses offered in the first four semesters for the First & Second UG students.

Non Major Elective / Skill Based Elective:

These courses are offered in two perspectives as electives "With-in School" (WS) and "Between School" (BS).

Subject Code Fixation

The following code system (11 characters) is adopted for Under Graduate courses:

14	UXX	X	X	XX	XX
↓	↓	↓	↓	↓	↓
Year of Revision	UG Code of the Dept	Semester of the Part	Specification	Subject Category	Running in that part
14	UCH	1	3	2	1

For Example :

I B.Sc. Chemistry, first semester General Chemistry-I

The code of the paper is 14UCH130201.

Thus, the subject code is fixed for other subjects.

Subject Category

- 00 - Languages (Tamil / Hindi / French / Sanskrit)
- 01 - General English
- 02 - Core (Theory, Practicals, Comprehensive Exams, Internship & Project viva-voce)
- 03 - Core Electives
- 04 - Allied
- 05 - Additional core Courses for Extra Credits (If any)
- 06 - Skill Based Electives (BS) & (WS)
- 07 - Soft Skill
- 08 - NMC (Communicate English, Computer Literacy/SAP)
- 09 - EVS
- 10 - Value Education
- 11 - SHEPHERD & Gender Studies
- 12 - AICUF / Nature Club / Fine Arts / NCC / NSS /etc.

EXAMINATION

Continuous Internal Assessment (CIA):

UG - Distribution of CIA Marks	
Passing Minimum: 40 Marks	
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
CIA	100

MID-SEM & END – SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective + Descriptive elements; with the existing question pattern PART-A; PART-B; and PART-C
2. CIA Component III for UG & PG will be of 15 marks and compulsorily objective multiple choice question type.
3. The CIA Component III must be conducted by the department / faculty concerned at a suitable computer centres.
4. The 10 marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS; TRUE / FALSE; and FILL-IN BLANKS.
5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.
6. English Composition once a fortnight will form one of the components for UG general English

SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: 30 Marks

Objective MCQs only

Answers are to be marked on OMR score-sheet. The OMR score-sheets will be supplied along with the Main Answer Book. 40 minutes after the start of the examination the OMR score-sheets will be collected

Part-B + C = 70 Marks

Descriptive

Part-B: 5 x 5 = 25 marks; inbuilt choice;

Part-C: 3 x 15 = 45 marks; 3 out of 5 questions, open choice.

The Accounts Paper of Commerce will have

Part-A: Objective = 25

Part-B: 25 x 3 = 75 marks.

Duration of Examination must be rational; proportional to teaching hours
90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

EVALUATION

Percentage Marks, Grades & Grade Points

UG (Passing minimum 40 Marks)

Qualitative Assessment	Grade Points	Grade	Mark Range (%)
Exemplary	10	S	90 & above
Outstanding	9	A+	85-89.99
Excellent	8	A	80-84.99
Very Good	7	B	70-79.99
Good	6	C	60-69.99
Satisfactory	5	D	50-59.99
RA	4	E	40-49.99
	0	RA	<40

CGPA - Calculation

Grade Point Average for a semester is calculated as indicated here under:

$$\frac{\text{Sum total of weighted Grade Points}}{\text{Sum of Credits}}$$

Weighted Grade Points is **Grade point x Course Credits**. The final CGPA will only include: Core, Core Electives & IDCs.

A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.

Continuous Internal Assessment (CIA):

Class	Mark Range (%)
Distinction	75 & above, first attempt
First	60 & above
Second	50 to 59.99
Third	40 to 49.99

Declaration of Result:

Mr./Ms. _____ has successfully completed the Under Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part – III is _____ and the class secured is _____ by completing the minimum of 150 credits.

The candidate has acquired _____ (if any) more credits from SHEPHERD / AICUF/ FINE ARTS / SPORTS & GAMES / NCC / NSS / NATURE CLUB, ETC. The candidate has also acquired _____ (if any) extra credits offered by the parent department courses.

B. Sc. CHEMISTRY
Course Pattern - 2014 Set

Se m	Part		Code	Course	Hrs	Crs	
I	I	Language	14UGT110001	Language - I: (Tamil / Hindi / French / Sanskrit)	4	3	
	II	English	14UGE120101	General English I	5	3	
	III	Core		14UCH130201	General Chemistry I	7	6
			@		Chemistry Practical I	3	@
		@		Chemistry Practical II	3	@	
	Allied		14UCH130401	Allied: Mathematics - I	6	5	
	IV	NMC		14UCE140801	Communicative English	0	5
		V. Edn		14UFC141001	Value Education: Essentials of Ethics, Yoga and Stress Management	2	2
	Total for semester I					30	24
	II	I	Language	14UGT210002	Language - II: (Tamil / Hindi / French / Sanskrit)	4	3
II		English	14UGE220102	General English II	5	3	
III		Core		14UCH230202	General Chemistry II	5	4
			@		Chemistry Practical I	3	4
		@		Chemistry Practical II	3	4	
Allied			14UCH230402	Allied: Mathematics - II	6	5	
IV		NMC		14UCE240802	Computer Literacy / SAP	2	2
		V. Edn		14UFC241002	Techniques of social analysis	2	2
Total for semester II					30	27	
III	I	Language	14UGT310003	Language - III: (Tamil / Hindi / French / Sanskrit)	4	3	
	II	English	14UGE320103	General English III	5	3	
	III	Core		14UCH330205	General Chemistry III	4	3
			@		Essentials of p-Block Elements	4	3
			@		Chemistry Practical III	3	@
		Allied		14UCH330403 A	Allied: Physics - I OR	4	3
				14UCH330403 B	Allied: Biochemistry - I		
		Allied	@		Allied: Physics Practical - I OR	2	@
		@		Allied: Biochemistry Practical - I			
	IV	NMC		14UCE340901	Environmental Studies	2	2
		V. Edn		14UFC341003 A	Professional Ethics I: Social Ethics OR	2	2
				14UFC341003 B	Professional Ethics I: Religion Doctrine		
	Total for semester III					30	19

IV	I	Language	14UGT410004	Language - IV: (Tamil / Hindi / French / Sanskrit)	4	3	
	II	English	14UGE420104	General English IV	5	3	
	III	Core		14UCH430207	General Chemistry IV	6	5
				14UCH430208	Chemistry Practical III	3	3
		Core Elective		14UCH430301 A (WS) : Material Science OR 14UCH430301 B Health and Hygiene	4	3	
	III	Allied		14UCH430404 A Allied: Physics - II OR 14UCH430404 B Allied: Biochemistry - II	4	3	
				14UCH430405 A Allied Physics Practical OR 14UCH430405 B Allied Biochemistry Practical			
				14UFC441004 A Professional Ethics II: Social Ethics OR 14UFC441004 B Professional Ethics II: Religion Doctrine	2	2	
	Total for semester IV					30	24
V	III	Core		14UCH530209	Inorganic Chemistry I	5	4
	III			14UCH530210	Organic Chemistry I	5	4
	III			14UCH530211	Physical Chemistry I	4	4
	III		@		Chemistry Practical IV	4	@
	III		@		Chemistry Practical V	4	@
	III	Core Elective		14UCH530302 A (WD): Selected Topics in Physical Chemistry OR 14UCH530302 B Selected Topics in Chemistry-I	4	3	
	IV	SBE		14UCH540601 (BS): Inter-disciplinary skill based course - Food and Nutrition	2	2	
		IDC		14USS540701 Soft skills	2	2	
Total for semester V					30	19	
VI	III	Core		14UCH630212	Internship	-	2
				14UCH630213	Inorganic Chemistry II	4	4
				14UCH630214	Organic Chemistry II	5	5
				14UCH630215	Physical Chemistry -II	4	4
				14UCH630216	Chemistry Practical IV	4	4
				14UCH630217	Chemistry Practical V	4	4
	III	Core		14UCH630218	Comprehensive Examination	-	2
				14UCH630303 A Chemistry of Biomolecules OR 14UCH630303 B Pharmaceutical Chemistry (<i>within Department</i>)	4	3	
	III	Elective		14UCH630304 A (WD) : Selected Topics in Chemistry – II OR 14UCH630304 B Selected Topics in Chemistry – III	3	2	
				14UCH640602 (WS) : Everyday Chemistry	2	2	
	Total for semester VI					30	32
	I-V	V		14UCW651101	SHEPHERD and Gender Studies		5
	Total Credit for all semesters					180	150

* Code numbers according to the subject chosen
@ Practical examination in the following even semester.

gUtk; 1
14UGT110001

kz p Neuk; 4
Gssrfs; 3

ngHJ j j kpo;-I

Nehf;fqfs;

1. r%f khwwr; rpej i dfi s c s s l f f i a j w f h y , y f f i a q f i s m w p k f k ; n r a j y ;
2. G J f f t p i j > r p W f i j > c i u e i l M f i a , y f f i a q f s ; p d e a k ; g h u h l l j y ;
3. r e j i g g p i o a p d w p v O j k h z t h f i s g ; g a p w w t i j j y ;

gad;fs;

1. k h z t h f s ; r % f k h w w r r p e j i d f i s m w p e j n f h s ; t h ;
2. r e j i g g p i o f i s e f f p v O j k ; j p w d ; n g W t h ;
3. G j j y f f i a q f i s g ; g i l f f k ; j p w i d A k ; j p w d h a ; T n r a A k ; j p w i d A k ; n g W t h ;

myF-1: k f h f t p g h u j p a h h ; f t p i j f s ;

g h u j i j h r d ; f t p i j f s ;
c i u e i l - K j y ; % d w f l l i u f s ; (10 k z p Neuk)

myF-2: g l l f n f h l i l a h h ; g h l y f s ;

g h t y N u W n g U Q r i j j p d h h ; g h l y f s ;
, y f f z k ; - t y p k p f h , l q f s ; (12 k z p Neuk)

myF-3: G J f f t p i j t b t q f s ;

, y f f i a t u y h W - % d w h k ; g h f k ;
r p W f i j - K j y ; M W r p W f i j f s ; (10 k z p Neuk)

myF-4: G J f f t p i j f s ;

n g z z p a f ; f t p i j f s ;
, y f f i a t u y h W - e h d ; f h k ; g h f k ;
, y f f z k ; - t y p k p f h , l q f s ; (14 k z p Neuk)

myF-5: n k h o p n g a h g G f f t p i j f s ;

r p W f i j - 7 K j y ; 12 K b a c s s r p W f i j f s ;
c i u e i l - 4 K j y ; 6 K b a c s s f l l i u f s ; (14 k z p Neuk)

ghl E)y;

1. n g H J j j k p o ; n r a A s ; j p u l l - j k p o h a ; T j ; J i w n t s p a l - 2 0 1 4 - 2 0 1 7
2. r % f t p a y ; N e h f ; f i y ; j k p o ; , y f f i a t u y h W > j k p o h a ; T j ; J i w n t s p a l > J } a t s d h h ; f y ; Y } h p j p U r r p u h g g s s p 2 > 2 0 1 4
3. c i u e i l f ; N f h i t - j k p o h a ; T j ; J i w n t s p a l > 2 0 1 4
4. r p W f i j j n j h F g G

Sem. I
14UGE120101

Hours/Week: 5
Credits: 3

GENERAL ENGLISH-I

Objectives

To help students

- * Use words and phrases related to self, home, friends and relatives in meaningful contexts.
- * Use language to perform basic functions like describing, clarifying, suggesting, and giving directions.

Unit-1

01. Personal Details
02. Positive Qualities
03. Listening to Positive Qualities
04. Relating and Grading Qualities
05. My Ambition
06. Abilities and Skills
07. Self-Improvement Word Grid
08. What am I doing?
09. What was I doing?
10. Unscramble the Past Actions
11. What did I do yesterday?

Unit-2

12. Body Parts
13. Actions and Body Parts
14. Value of Life
15. Describing Self
16. Home Word Grid
17. Unscramble Building Types
18. Plural Form of Naming Words
19. Irregular Plural Forms
20. Plural Naming Words Practice
21. Whose Words?

Unit-3

22. Plural Forms of Action Words
23. Present Positive Actions
24. Present Negative Actions
25. Un/Countable Naming Words
26. Recognition of Vowel Sounds
27. Indefinite Articles

28. Un/Countable Practice
29. Listen and Match the Visual
30. Letter Spell - Check
31. Drafting Letter

Unit 4

32. Friendship Word Grid
33. Friends' Details
34. Guess the Favourites
35. Guess Your Friend
36. Friends as Guests
37. Introducing Friends
38. What are We Doing?
39. What is (s)he / are they Doing?
40. Yes / No Question
41. What was s/he doing?
42. Names and Actions
43. True Friendship
44. Know your Friends
45. Giving Advice/Suggestions
46. Discussion on Friendship
47. My Best Friend

Unit 5

48. Kinship Words
49. The Odd One Out
50. My Family Tree
51. Little Boy's Request
52. Occasions for Message
53. Words denoting Place
54. Words denoting Movement
55. Phrases for Giving Directions
56. Find the Destination
57. Giving Directions Practice
58. SMS Language
59. Converting SMS
60. Writing Short Messages
61. Sending SMS
62. The family debate
63. Family Today

Textbook

1. Joy, J.L. & Peter, F.M. (2014). *Let's Communicate*, New Delhi, Trinity Press.

Sem. I
14UCH130201

Hours/Week: 7
Credits: 5

GENERAL CHEMISTRY-I

Objectives

- To understand the bonding and nomenclature of organic molecules
- To learn periodic properties of elements
- To understand the principles of quantum mechanical aspects in atomic particles
- To learn the properties of gases
- To understand the theoretical aspects of inorganic qualitative and volumetric analyses of inorganic analytes

Unit I: Bonding and Molecular Structure (21 Hours)

Covalent bonding – Concept of hybridization – Structure of organic molecules based on sp^3 , sp^2 and sp hybridization – Covalent bond properties of organic molecules: bond length, bond angle, bond energy, bond polarity, dipole moment, inductive, mesomeric, electromeric, resonance and hyper conjugative effects – Naming of organic compounds (up to 10 carbon systems) – Hydrocarbons – monofunctional compounds – Bifunctional compounds – Isomerism – Types of isomerism (structural and stereoisomerisms) with appropriate examples.

Unit II: Basic Quantum Chemistry (21 Hours)

CGS and SI units – Basic units – derived units – subsidiary units – dimensional analysis – Quantum theory and atomic spectra – Bohr's model of atom – Limitations of Bohr model – Sommer field's model – photo electric effect - Compton effect – de Broglie equation – Davisson and Germer experiment – Heisenberg's uncertainty principle – Schrödinger's wave equation (statement only) Particle in a box - Eigen values - Eigen function - Significance of ψ and ψ^2 - Radial and angular distribution function – Concept and Shapes of orbitals.

Unit III: Periodic Table and Periodic Properties (21 Hours)

Mendeleev's periodic classification-modern periodic table- grouping of elements into s, p, d, and f blocks-periodic properties- atomic radius: covalent, van der Waals and ionic radii – determination of ionic radii by Pauling's method. Slater's rules- screening constant and effective nuclear charge-ionic radii of isoelectronic ions- ionization energy (IE)- factors affecting IE

–periodic variation of IE – comparison of IE of N and O; Mg and Al; Be and B. Electron affinity – periodic variation - electron affinity of halogens. Electronegativity and its applications in predicting bond character.

Unit IV: Gaseous state (21 Hours)

Gaseous state – The gas constant R in different units - Deviation from ideal behaviour – van der Waals equation for real gases – critical phenomenon – PV isotherm of real gases, critical temperature – critical volume – molecular velocities – root, mean square, average and most probable velocities – Maxwell law for distribution of molecular speed (No need of derivation) – collision number and mean free path – collision diameter.

Unit V: Analytical Methods-I (21 Hours)

Qualitative Inorganic Analysis: Dry test, flame test, Cobalt nitrate test - Wet confirmatory tests for acid radicals - Interfering acid radicals- Theory of Interference- Elimination of Interfering acid radicals.

Volumetric Analysis: Preparation of standard solutions-normality and molarity - acid-base titrations-types of acid-base titrations-titration curves-selection of suitable indicators.

Error analysis: Accuracy, precision, error-types of errors – determinate & indeterminate- Mean- median- standard deviation- and variance.

Reference

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co.,(1993) [Textbook]
2. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
3. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal, Nagin Chand & Co., (1993). [Textbook]
5. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
6. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997). [Textbook]
7. Frank J. Welcher and Richard B. Hahn, Semimicro Qualitative Analysis, New Delhi, Affiliated East-west Press pvt. Ltd. (1969).
8. Mehta, B. and Mehta.M, Organic Chemistry, PHI learning Pvt. Ltd., New Delhi (2012).

**Sem. I
14UCH130401**

**Hours/Week: 6
Credits: 5**

**ALLIED MATHEMATICS I
FOR CHEMISTRY**

Objectives

- * To train the students in mastering the techniques of various branches of Mathematics.
- * To motivate the students to apply the techniques in their respective major subjects.

UNIT - I

Partial fractions – Binomial series – Summation of series – Finding terms – Coefficient of x^n (simple problems only). (Chapter 1 – sec 1.1 – 1.2, pages: 1- 27).

UNIT - II

Exponential series – Summation – Logarithmic series – Summation. (Chapter 1 – sec 1.3, pages: 28 -48).

UNIT - III

Matrices – Rank of a matrix – Solving simultaneous linear equation in three unknowns using Elementary Operations method – Eigen values and Eigen vectors – Verification of Cayley Hamilton theorem. (Chapter 3- sec 3.2 – 3.4, pages: 137 – 160).

UNIT - IV

Higher Derivatives – Formation of equations involving derivatives – Applications of Leibnitz's theorem. (Chapter 6 – sec 6.1, pages: 266 – 281).

UNIT - V

Expansion of $\cos q$ and $\sin q$ – Powers of sines and cosines of q in terms of functions of multiples of q . (Chapter 5- sec 5.1 – 5.4, pages: 220 – 242).

Text Book

1. Ancillary Mathematics, Vol – I, 2009 Edition, S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay, Kandaswamy.

gUtk; 2
14UGT210002

kz p Neuk; 4
GSSpfs; 3

ngHJ j j kp;II

Nehf;fqfs; :

1. rka eyyrz ff cz hi t tshj j y;
2. j kpof; fhggjaqfs; moFk; mwTz hTk; C I Lk; gFj pfi sg; gbj Jg; GheJ nfhsS j y;
3. c i uei l f; fl Li u vOJk; j pwd; ngWj y;

gad;fs; :

1. j kpi oj; j pJj j khfg; gbffTk; NgrTk; gii oapdwp vOj Tk; Nj hrrp ngWj y;
2. , yffjaqfs; gbj j twi w Ki wahf thofi faip; fi l ggpbj j y;

myF: 1 (12 kz p Neuk)

rpyggj pfhuk; - kJi uf; fhz j k; (fhL fhz ; fhi j)
, yffja tuyhW - i rtk; tsuj j j kp; Kj y; Guhz qfs; Kba.

myF : 2 (12 kz p Neuk)

kz pNkfi y - ghj j uk; ngww fhi j
nghpGuhz k; - nkagngHUsehadhh; Guhz k;

myF : 3 (12 kz p Neuk)

fkguhkhaz k; - fhL rpgl yk;
c i uei l - 7 Kj y; 9 Kba c ss fl Li ufs;
, yffz k; - vOj j pyffz k;

myF : 4 (12 kz p Neuk)

Fz qFb k] j hd; rhfG ghl yfs;
rwwpyffjaqfs; - fyqfj Jgguz p
c i uei l - 10 Kj y; 11 ti uayhd fl Li ufs;

myF : 5 (12 kz p Neuk)

, ul rz ja ahj j pffk; kuz ggl yk;
, yffja tuyhW - j kp; , yffz E}yfs; Kj y; rwwpyffjaqfs;
Kba.
, yffz k; - nrhyypffz k;

ghl E}y;

1. nraAs; j pul L - j kpha;Tj Ji w ntsjal > 2014-2017.
2. r%ftay; Nehff; j kp; , yffja tuyhW > j kpha;Tj Ji w ntsjal > J}atsdhh; fy;Y}hp j pUrrpuhggssp 2014.
3. c i uei l fNfhi t > j kpha;Tj Ji w ntsjal > 2010.

SEM-II
14UGE220102

Hours/week: 5
Credits: 3

GENERAL ENGLISH-II

Objectives

To help students

- * Use words and phrases related to education, entertainment, career, and society in meaningful contexts.
- * Use language to perform basic functions like comparing, debating, and storytelling.

Unit 1

01. Education Word Grid.
02. Reading Problems and Solutions.
03. Syllabification.
04. Forms for Expressing Quality.
05. Expressing Comparison.
06. Monosyllabic Comparison.
07. Di/polysyllabic Comparison.
08. The best monosyllabic Comparison
09. The best di/polysyllabic Comparison.
10. Practising Quality Words.

Unit 2

11. Wh Words
12. Yes/No Recollection
13. Unscramble Wh Questions
14. Wh Practice
15. Education and the Poor
16. Controlled Role play
17. Debate on Education
18. Education in the Future
19. Entertainment Word Grid
20. Classify Entertainment Wordlist
21. Guess the Missing Letter
22. Proverb-Visual Description
23. Supply Wh Words
24. Rearrange Questions
25. Information Gap Questions

Unit 3

26. Asking Questions
27. More about Actions
28. More about Actions and Uses

29. Crime Puzzle
30. Possessive Quiz
31. Humourous News Report
32. Debate on Media and Politics
33. Best Entertainment Source

Unit 4

34. Career Word Grid
35. Job-Related Wordlist
36. Who's Who?
37. People at Work
38. Humour at Workplace
39. Profession in Context
40. Functions and Expressions
41. Transition Fill-in
42. Transition Sord Selection
43. Professional Qualities
44. Job Procedures
45. Preparing a Resume
46. Interview Questions
47. Job Cover Letter Format
49. E-mailing an Application
50. Mock Interview

Unit 5

51. Society Word Grid
52. Classify Society Wordlist
53. Rearrange the Story
54. Storytelling
55. Story Cluster
56. Words Denoting Time
57. Expressing Time
58. What Can You Buy?
59. Noise Pollution
60. Positive News Headlines
61. Negative News Headlines
62. Matching Conditions
63. What Whould You Do?
64. If I were the Prime Minister
65. My Dream Country

Textbook

1. Joy, J.L. & Peter, F.M. (2014). *Let's Communicate*, New Delhi: Trinity Prss.

Sem. II
14UCH230202

Hours/Week: 5
Credits: 4

GENERAL CHEMISTRY-II

Objectives

- To understand the conformational isomerism and chemistry of alkanes.
- To learn metallurgy.
- To understand the principles of radioactivity and nuclear chemistry.
- To understand the aspects of thermodynamics.
- To understand the theoretical aspects of inorganic qualitative and volumetric analyses.

Unit I: Alkanes

(15 Hours)

Nomenclature of alkanes and cycloalkanes, Petroleum source of alkanes – Methods of preparing alkanes – Chemical properties — Mechanism of free radical substitution in alkanes by halogenation-Uses – Conformational study of ethane and n-butane - Relative stability of cycloalkanes from cyclopropane up to cyclooctane - cyclohexane and mono-and disubstituted cyclohexanes.

Unit II: Metallurgy and s-block elements

(15 Hours)

Occurrence of metals - steps involved in the metallurgical processes - concentration of ore by froth floatation, gravity separation and magnetic separation processes. Calcination- roasting - smelting - aluminothermic process - Purification of metals by electrolysis and zone refining. Position of Hydrogen in the periodic table - isotopes of hydrogen- ortho and para hydrogen.

s-block elements - alkali metals-general characteristics - oxides, hydroxides, halides - Alkaline earth metals- general characteristics.

Unit III: Radioactivity and Nuclear chemistry

(21 Hours)

Radiations emitted by radioactive substances, the half- life period, radioactive equilibrium, Soddy- Fajan group displacement law. Theory of radioactivity, N/P ratio. Isotopes- Isobars and Isotones - Applications of radio activity - Nuclear forces- packing fraction - mass defect - binding energy - Nuclear fission- atom bomb and nuclear reactors - Nuclear fusion, fusion reaction in the sun, Hydrogen bomb.

Unit IV: Thermodynamics – I

(15 Hours)

Chemical thermodynamics – system – surroundings – isolated, closed and open systems – Homogeneous and heterogeneous systems – state of the

system – intensive and extensive properties – thermodynamic process – cyclic process – reversible and irreversible process – isothermal and adiabatic process – state and path functions – exact and inexact differentials – concept of heat and work – work of expansion at constant pressure and free expansion – First law of thermodynamics – statement – definition of internal energy (U), enthalpy (H) and heat capacity – U and H as thermodynamic properties – relationship between C_p and C_v – calculation of W, q, dU and dH for expansion of ideal and real gases under isothermal and adiabatic conditions for reversible and irreversible process – Joule Thomson effect – Relation between μ_{JT} and other thermodynamic quantities – calculation of Joule Thomson coefficient for ideal and real gases – inversion temperature – Zeroth law of thermodynamics – Absolute scale of temperature.

Unit V: Analytical Methods-II (15 Hours)

Analysis of basic radicals: Group separation and confirmatory tests for basic radicals - Uses of complexing agents in qualitative analysis- common ion effect and solubility product - role of solubility product in the precipitation of various cations in different groups in qualitative analysis. Volumetric Analysis: Redox titrations, complexometric titrations (EDTA titration), precipitation titrations - iodometry, iodimetry and permanganometry.

REFERENCES

1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
2. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997) [Textbook]
3. Pine S.H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill International Book Company. (1986).
4. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993) [Textbook]
5. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
6. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
7. Mehta, B. and Mehta.M, Organic chemistry, PHI learning Pvt. Ltd., New Delhi (2012). [Textbook]

Sem. I & II
14UCH230203

Hours/Week: 3
Credits: 3

Chemistry Practical-I **INORGANIC QUALITATIVE ANALYSIS**

Objectives

- To learn the types, hazards and handling of chemicals and glassware.
- To know the concept of solubility product.
- To know the concept of common ion effect.
- To learn the techniques of semi micro qualitative analysis of inorganic salt mixtures.

Unit I: Working in Chemistry Lab

Introduction – Personal protection – Nature of Chemicals – Toxic, Corrosive, Explosive, Inflammable, Carcinogenic, other hazardous chemicals – Safe storing and handling of chemicals – Disposal of chemical wastes – Glassware – Handling of Glassware – Handling of different types of equipments like Bunsen burner, Centifuger, Kipp's Apparatus, etc. – Ventilation facilities – Philosophy of Lab Safety – First-Aid techniques – General work culture inside the chemistry lab- importance of wearing lab coat, eye glasses.

Unit II: General Principles of Qualitative Analysis

Principle of Flame testing – Concept of solubility and solubility product – Theory of Acids and Bases – Concept of pH and Buffer action – Common ion effect – Redox reactions – Theory of testing acid radicals (simple and interfering) – Principle of grouping of cations – Theory of testing cations.

Unit III: Semi-micro Qualitative Analysis

1. Analysis of simple acid radicals: carbonate, sulphide, sulphate, chloride, bromide, iodide, nitrate
2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, chromate, arsenite
3. Elimination of interfering acid radicals and Identifying the groups of basic radicals
4. Analysis of basic radicals (group-wise): Lead, copper, bismuth, cadmium, antimony, iron, aluminum, chromium, zinc, manganese, nickel, calcium, strontium, barium, magnesium, ammonium
5. Repeating the tests in no. 04.
6. Repeating the tests in no. 04.

7. Analysis of a mixture-I containing two cations and two anions (of which one is interfering type)
8. Analysis of a mixture-II containing two cations and two anions (of which one is interfering type)
9. Analysis of a mixture-III containing two cations and two anions (of which one is interfering type)
10. Analysis of a mixture-IV containing two cations and two anions (of which one is interfering type)
11. Analysis of a mixture-V containing two cations and two anions (of which one is interfering type)
12. Analysis of a mixture-VI containing two cations and two anions (of which one is interfering type)
13. Analysis of a mixture-VII containing two cations and two anions (of which one is interfering type)
14. Analysis of a mixture-VIII containing two cations and two anions (of which one is interfering type)
15. Analysis of a mixture-IX containing two cations and two anions (of which one is interfering type)
16. Analysis of a mixture-X containing two cations and two anions (of which one is interfering type)

Unit IV: Some Applied Experiments (Demonstration only)

17. Analysis of water for the presence of ions like calcium, magnesium, iron, sulphate, chloride, fluoride, carbonates.
18. Analysis of Cement for the presence of ions like calcium, aluminium, iron, zinc, sulphate, chloride, phosphate
19. Analysis of soil for the presence of minerals like potassium, sodium, nitrate, chloride, phosphate.
20. Analysis of a binary alloy.

REFERENCE

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & Sons (1997).

Sem. I & II
14UCH230204

Hours/Week: 3
Credits: 3

Chemistry Practical-II
VOLUMETRIC ANALYSIS

Objectives

- To learn the techniques of titrimetric analyses.
- To learn to handle chemical balance.
- To know the estimation of total hardness of water.

Unit-I: Introduction to Quantitative Analysis

Introduction – Types of Quantitative analyses – Theory of significant figures – Error analysis – Principles of Chemical Balances (double-pan and single-pan) – Apparatus used in titrimetric analysis – Handling of Chemical balances and other apparatus – Concept of Molecular weight, Formula weight, Equivalent weight – Concentrations of solutions – Molarity, Formality, Normality, Weight percentage.

Unit-II: General Principles of Titrimetry (Volumetric analysis)

Principle of titrimetry – Primary and secondary standards – Preparing standard solutions – Standardizing the secondary standard solutions – Types of titrimetric analyses – Principal reactions – Concepts of acids, bases, oxidants, reductants – Theory of Indicators – Calculations for strengths of solutions and the amounts of substances in solutions.

Unit-III: Titrimetric Quantitative Analysis

1. Preparation of a standard solution (Weighing in Chemical balance)
2. Making up a given solution and doing a titration
3. Preparing a standard solution and doing a titration
4. Making up a given solution and doing a double titration
5. Estimation of strength of a solution
6. Estimation of HCl by NaOH using a standard oxalic acid solution.
7. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 solution.
8. Estimation of Oxalic acid by KMnO_4 using a standard oxalic acid solution.
9. Estimation of $\text{K}_2\text{Cr}_2\text{O}_7$ by Standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
10. Estimation of $\text{K}_2\text{Cr}_2\text{O}_7$ by Thio solution.
11. Estimation of Iron(II) by KMnO_4 using a standard Mohr's salt solution
12. Estimation of KMnO_4 by thio using a standard potassium dichromate solution

13. Estimation of Iron(II) by $K_2Cr_2O_7$ using a standard Mohr's salt solution
14. Estimation of Copper(II) sulphate by $K_2Cr_2O_7$ solution.
15. Estimation of Copper by standard $CuSO_4$ solution.
16. Estimation of Magnesium(II) by EDTA solution.
17. Estimation of Calcium by permanganometry.

Unit-IV: Some Applied Experiments

18. Estimation of Total Hardness of water
19. Estimation of Antacid
20. Estimation of Bleaching powder

Reference

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, New Delhi, Second edition, Sultan Chand & Sons, (1997).
2. Bassett, J., et al., Vogel's Textbook of Quantitative Inorganic Analysis, (4th edition), ELBS Longman, (1985).

Sem. II
14UCH230402

Hours/Week: 6
Credits: 5

ALLIED MATHEMATICS - II
(For Chemistry students)

Objectives

- * To train the students in mastering the techniques of various branches of Mathematics.
- * To motivate the students to apply the techniques in their respective major subjects.

UNIT-I

Integration – Integrals of functions containing linear functions of x – Integrals of functions involving $a^2 + x^2$ – Integrals of rational algebraic functions – Integration of irrational functions. (Book 1: Chapter 1: sec 6.1, 6.2, 7 (omit 7.4), 8 case (i) to (iv) only, pages: 7 – 13, 23 – 31, 39 – 47)

UNIT-II

Properties of definite integrals – Simple applications – Integration by parts – Bernoulli's formula – Evaluation of double integrals (omit problems involving changing the order of Integration and applications). (Book 1:

Chapter 1: sec. 11, 12, 15, pages: 61 – 72, 93 and 94; Chapter 3: sec. 2.2, pages: 163- 170).

UNITIII

Differential equations of first order – variable separable – Homogeneous equations – Non-homogeneous equations – Linear equation – Bernoulli's equation. (Book 1: Chapter 4: sec. 1- 5, pages 205 – 218).

UNITIV

Second order linear equations with constant coefficients – particular integrals for e^{kx} , $\sin kx$, $\cos kx$, x^n and $e^{kx}X$. (Book 2: Chapter 3: sec. 1-4, pages: 42 – 60).

UNITV

Laplace transforms – Definition – some general theorems – Inverse transform - solving ordinary differential equations using Laplace transformation. (Book 1: Chapter 7: sec. 7.1 – 7.7, pages 289 – 315).

Text Book

1. Ancillary Mathematics, Vol – II, 2009 Edition, S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay, Kandaswamy.
2. Ancillary Mathematics Book II: Narayanan, Manicavachagom Pillay.

gUtk; 3
14UGT310003

kz p Neuk; 4
GSSpfs; 3

nghJ j j kp;III

Nehffqfs; :

1. nrknkhorj ; j kpr; nraAs;fshd gj pndz Nky; fz fF> gj pndz ; fb; fz fFg; ghl y;fi sg; gbj Jg; nghUs; GhpeJ nfhs;S k; j pwd; ngWj y;
2. gz i l , yffjaqfs;mi keJss r%ff; fUj J ffi s c z hj Jj y;
3. kuGf; ftpi j tbtqfi s mwpar; nraj y;
4. ftpi j fsy; mz pfs; mi keJss ghqi fg; Ghj y;
5. Gj pdk; top j wfhyr; rKj har; rfffyfi sAK> mj wfhd j hTfi sAK; Muhaej wj y;

gadfs; :

1. nrknkhorj; j kpr; nkhorj; rpwgi g mwj y;
2. gz i l , yffjaqfs; c z hj Jk; mwf;fUj J ffi s mwpeJ khz th; xOff newpaj; thoeJ r%fji j NkkgLj J th;
3. khz th; Gj pdj i j f; fwgj d; %yk; rKj har; rfffyfi s c z heJ mtwppwFj ; j hT fhz gh;

myF : 1 (16 kz p Neuk)
nghUeuhWggi l (KOi kAk)

myF : 2 (10 kz p Neuk)
FWenj hi f> ahggyf;fz k; (ntz gh> Mrhpaggh)

myF : 3 (10 kz p Neuk)
fyj nj hi f , yffja tuyhW - lj kpr; nkhorj; nj hdi kAk; rpwgGk;
Kj y; |rqfj ; nj hi f E)yfs| Kba. Gj pdk; - KOi kAk;

myF : 4 (12 kz p Neuk)
gj pwWggj J> GwehD}W> mz pajyffz k;

myF : 5 (12 kz p Neuk)
j pUfFws; - mwk;
ehybahh; - nghUl ghy;
, yffja tuyhW - rqf , yffjaqfs;pd; j dj j di kfs; Kj y; , ul i l f;
fhggjaqfs; Kba.

ghl E)yfs; :

1. nraAs; j pul L> j kpha;Tj J i w ntspal (2014-2017)
2. r%ftjay; Nehffiy; j kppfyfja tuyhW> j kpha;Tj J i w ntspal>2014
3. Gj pdk; (xtnthU fytjahz Lk; xtnthU Gj pdk).
nehej NrhW (2014-2015)

SEM-III
14UGE320103

Hours/week: 5
Credits: 3

GENERAL ENGLISH-III

Objectives:

- * To enable the students to comprehend the local and global issues through the lessons.
- * To enable the students to do the tasks centering on Skill Development and Grammar.
- * To empower the students with interactive skills.

Tasks Designed for Each Unit	Skills Focused to be Developed for Each Unit	Hours Allotted
1. Pre-reading Task	Listening and Reading Skills through teacher-led reading practice	2 Hours
2. Objectives	Listening and Reading Skills	
3. Text	Listening and Reading Skills through teacher-led reading practice	
4. Glossary (Using Words and Phrases in Sentences)	Referring and Language Using Skills	2 Hours
5. Reading Comprehension	Reading, Speaking, and Writing Skills	1 Hour
6. Critical Analysis	Critical Thinking and Speaking Skills	2 Hours
7. Creative Task	Creative Thinking and Speaking Skills	2 Hours
8. General Writing Skills	Writing Skill	1 Hour
9. Activities on Grammar	Grammar Using and Writing Skills	2 Hours

UNIT I

* Suggestions to Develop Your Reading Habit 12 Hrs
Grammar: Simple Present Tense

UNIT II

* The Secret of Success: An Anecdote 12 Hrs
Grammar: Present Continuous Tense

UNIT III

* Hygiene 12 Hrs
Grammar: Simple Past Tense

UNIT IV

* Dr. A.P.J. Abdul Kalam: A Short Biography 12 Hrs
Grammar: Past Continuous Tense

UNIT V:

* "Golden Rule": A Poem 12 Hrs
Grammar: Simple Future Tense & Future Continuous Tense

Textbook:

1. Jayraj, S. Joseph Arul *et al.* (2014). *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*, New Delhi, Trinity.

GENERAL CHEMISTRY-III

Objectives

- To learn the nuances of stereochemistry.
- To learn the chemistry of aliphatic unsaturated hydrocarbons.
- To study the second and third laws of thermodynamics and their applications.

Unit I: Stereochemistry (12 Hours)

Stereoisomerism – Types – Optical isomerism – Chirality - Optical activity – Measurement of optical activity – Concept of enantiomerism, diastereomerism - R-S, D-L and E-Z notations to express configurations – Erythro, threo conventions – meso and dl-forms of tartaric acid - Methods of Resolution of Racemic mixture – Walden Inversion – Asymmetric synthesis – Asymmetric induction- Stereoselective and stereospecific reactions.

Unit II: Alkenes (12 Hours)

Nomenclature – Geometrical Isomerism – Petroleum source of alkenes and aromatics – General methods of preparation of alkenes – Chemical properties – Uses – Elimination mechanisms (E1, E2, E1CB) – Electrophilic addition- General mechanism - Addition of HX (Markovnikov and Anti-Markovnikov's)- Addition of bromine- Addition of water (Oxymercuration-Demercuration, Hydroboration-oxidation)- Hydroxylation (Syn- and anti-dihydroxylation)- Reduction – Diels- Alder reaction- ozonolysis.

Unit III: Dienes and Alkynes (12 Hours)

Dienes: Types – MO of conjugated diene- General methods of preparation of Dienes - Physical properties – 1,2-1,4- addition of HX to conjugated dienes- ozonolysis.

Alkynes: Nomenclature- General methods of preparation of alkynes – Physical properties – Electrophilic addition of HX, water (Markovnikov and Anti- Markovnikov's), Hydrogen (to form Z-&E-alkenes)-Diels-Alder Reaction - Deprotonation: formation of alkynyl anions – ozonolysis.

Unit IV: Thermodynamics II (12 Hours)

Second law of Thermodynamics: Need for the law – Different statements of II law - Heat engine – Carnot's cycle and its efficiency – Thermodynamic scale of temperature.

Entropy as a state function – Entropy as a function of P,V and T- Entropy change in phase change – Entropy of mixing – Entropy as a criterion of spontaneous and equilibrium processes in isolated systems – Gibbs function(G) – Hemholtz function(A) as thermodynamic quantities - ΔA and ΔG as criteria for thermodynamic equilibrium and spontaneity – Their advantage over entropy change – Variation of ΔA and ΔG with P,V and T – Gibbs Hemholtz equations and their applications – Thermodynamic equation of state – Maxwell's relations

Unit V: Applications of II Law and III Law (12 Hours)

Equilibrium constant and free energy change - Thermodynamic derivation of law of mass action – K_p , K_c of NH_3 , PCl_5 and CaCO_3 system – Thermodynamic interpretation of Le Chatelier principle (concentration, Temperature, Pressure) - addition on inert gases – Reaction isotherm – Van't Hoff equation – Van't Hoff isochore – Clapeyron equation – Clausius Clapeyron equation and applications- Statement of third law and apparent exceptions to third law.

Reference

1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
2. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co. (1997) [Textbook]
3. Pine S.H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill International Book Company, (1986).
4. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal, Nagin Chand & Co., (1993) [Textbook]
5. Andrew F Parson, Key Notes in Organic Chemistry, Blackwell Science Publishers, (2003).

Sem. III
14UCH330206

Hours/Week: 4
Credits: 3

ESSENTIALS OF p-BLOCK ELEMENTS

Objectives

- To understand the chemistry of boron and carbon group elements
- To understand the chemistry of nitrogen and oxygen group elements
- To understand the chemistry of halogens and noble gases

Unit I: Boron group elements (12 Hours)

General Characteristics of Boron group elements with reference to electronic configuration, oxidation states, metallic character and inert pair effect - Diagonal relationship between B and Si. Acid strength of trihalides of boron – structure of diborane and borazole. Preparation, properties and structures of ortho boric acid. Borax bead test. Dimeric structure of AlCl_3 .

Unit II: Carbon Group Elements (12 Hours)

General characteristics of carbon group elements with reference to electronic configuration, oxidation states, metallic character, inert pair effect and catenation. Allotropy- structure of graphite and diamond. Differences between CO_2 and SiO_2 . Differences between CCl_4 and SiCl_4 . Preparation, properties and uses of silicon carbide and silicones. Reducing character of stannous chloride

Unit III: Nitrogen group elements (12 Hours)

Differences between nitrogen and rest of the family members- A comparative study on hydrides, halides and oxides of nitrogen group elements. Structure and basic character of ammonia. Oxyacids of nitrogen (HNO_2 , HNO_3) and phosphorous (H_3PO_3 , H_3PO_4 and $\text{H}_4\text{P}_2\text{O}_7$). Preparation, properties and structure of hydrazine..

UNIT IV: Oxygen group elements (12 Hours)

Anomalous behaviour of oxygen- paramagnetic nature of oxygen - preparation, properties, structure and uses of sulphuric acid, Caro's acid, Marshall's acid and oleum- Oxides: classification of oxides based on their chemical behaviour - acidic oxides, basic oxides, amphoteric oxides and neutral oxides. Classification of oxides based on oxygen content - normal oxides, peroxides, superoxides, dioxides, suboxides and mixed oxides. Preparation, structure, oxidizing and reducing character of hydrogen peroxide.

Unit V: Halogens and Noble gases (12 Hours)

Peculiarity of fluorine - hydrides, oxides and oxo acids of halogens. Preparation, structure and hydrolysis of inter halogen compounds. Pseudo halogens-chemical reactions.

Position of noble gases in the periodic table: Position in the periodic table- Isolation from atmosphere - general Characteristics- Structure and shape of xenon compounds – XeF_2 , XeF_4 , XeF_6 , XeO_3 and XeOF_4 .

References

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
2. Lee, J. D Concise Inorganic Chemistry, 5th Edition, UK, Black Well science (2006).

Sem. III
14UCH330403A

Hours/Week: 6
Credits: 5

Allied: PHYSICS-I

Objectives

- To acquire knowledge about mechanics and moving particles
- To study gravitation and elasticity and acquire knowledge about planets, satellites and their movements.
- To understand the principles of musical sound, sound waves and their application in day- to-day life.
- To study the various optical instruments and learn the method of handling them.
- To know the different types of semiconductor devices and their applications in radio and television system

Unit I: MECHANICS (10 Hours)

SHM-velocity, time, period, frequency, phase-equations of wave motion- compound pendulum- center of suspension-interchangeability center of oscillation and suspension- Moment of Inertia –Radius of gyration – Angular Momentum – torque – Theorems of M.I- M.I. of uniform rod, disc, circular ring, Annular ring, solid sphere –Kinetic energy of rotating energy- Acceleration of a body rolling down an inclined plane.

Unit II: GRAVITATION AND ELASTICITY (10 Hours)

Newton's law of gravitation-verification of G –Kepler's laws-relation of G and g - mass and density of earth-variation of the acceleration due to gravity - orbital velocity-escape velocity-types of moduli- Poission's ratio-relation between ν , n & s –bending of beams-bending moment-cantilever-cantilever loaded at one end-supported at two ends and loaded in the middle.

Unit III: SOUND (10 Hours)

Velocity of transverse waves along a stretched string-frequency of vibrating string -laws of transverse vibration of strings-verification of laws- Melde's experiment-ultrasonics- piezo-electric effect-production of ultrasonics-Experiment-detection of ultrasonics-applications-determination of velocity of sound in a liquid-reverberation-absorption

Unit IV: OPTICS (10 Hours)

Chromatic aberration-spherical aberration-spectrometer-determination of refractive index-Newton's rings-determination of wavelength and refractive index of liquid-plane transmission grating-resolving power of diffraction grating-determination of wavelength-double refraction Nicol prism-specific rotation-Laurant's polarimeter – Half shade device.

Unit V: BASIC ELECTRONICS (10 Hours)

Energy level in solids -intrinsic and extrinsic semi conductors -p-n junction-forward bias, reverse bias-volt-ampere characteristics of p-n junction diode-full wave rectifier- zener diode, tunnel diode, photo diode, LED -transistor-CE and CB characteristics-transistor amplifier.

Book For Study

1. A.S.Vasudeva, Modern Engineering Physics, S.Chand and CompanyLtd., 1988.
2. V.K.Mehta, Principles of Electronics, S.Chand and CompanyLtd., 2009.

Unit	Book	Sections
I	1	Part – IV : 1.1-1.6, 2.3, 1.8-1.10. Part – I : 4.2, 4.3, 4.6, 4.7, 4.9-4.11, 4.13-4.16, 4.20
II	1	Part I : 2.1-2.5, 2.7, 2.12, 2.13, 5.4, 5.9, 5.15-5.19.
III	1	Part – IV : 4.1-4.4, 6.1-6.9
IV	1	Part – III : 2.4, 2.9, 4.25-4.27, 5.21, 5.27, 5.28, 6.10, 6.16, 6.28-6.30.
V	2	5.1-5.19, 6.1,6.2, 6.11-6.15, 6.17, 6.18, 6.25, 6.27, 7.2-7.10, 7.12, 8.1-8.5, 8.9, 8.12

Sem. III
14UCH330403B

Hours/Week: 6
Credits: 5

**Allied:
BIOCHEMISTRY-I**

gUtk; 4
14UGT410004

kz p Neuk; 4
Gssps; 3

ngHJj j kP;IV

Nehf;fqfs; :

- ehl fj j pd; Nehffk; mj d; NghfF; c j j pfs; ghj j ug; ghqF; c i uahl y; Ki w; fwi dj j pwk; Nghdwtwi w nts;ggLj j y;
- Gj pa ehl fqfi sg; gi l fFk; j pi d khz tufspi l Na c UthfFj y;

gadfs; :

- ehl ftop mofpay; cz uTfi s tsuj j y;
- ehl fqfi sr; r%fg; gadghl bwF Vwg c UthfFj y;

myF : 1 (12 kz p Neuk)

kNdhdKz Bk; ghapuk; mqfK; - 1> fsk; 1 - 5 ti u.

myF : 2 (12 kz p Neuk)

kNdhdKz Bk; mqfK; - 2> fsk; 1 - 3 ti u.
c i uei l ehl fK; (Kj y; , uz L ehl fqfs)

myF : 3 (12 kz p Neuk)

kNdhdKz Bk; mqfK; - 3> fsk; 1 - 4 ti u.

myF : 4 (12 kz p Neuk)

kNdhdKz Bk; mqfK; - 4> fsk; 1 - 5 ti u.

myF : 5 (12 kz p Neuk)

kNdhdKz Bk; mqfK; - 5> fsk; 1 - 3 ti u.
c i uei l ehl fK; (3> 4Mk; ehl fqfs)

ghl E)yfs; :

- Rej udhu; kNdhdKz Bk; j kpha;Tj ;Ji w (gj gg) > J)a tsdhu; fy;Y)up j pUrr;puhggs;2. (mqfK; : 3 fsk; : 4 el;fyhf)
- mz z hki y.rp (nj h.M.)> Nr., uhkhD[k; ehl fqfs; fhtah nts;paL nrdj d

kj pngz ; gfmu;T :

kNdhdKz Bk; - 80

c i uei l ehl fK; - 20

c i uei l ehl fK; ghfK; - 3, y; fl Li u tpdhty; kl Lk; , l k; ngwy; Ntz Lk;

SEM-IV
14UGE420104

Hours/week: 5
Credits: 3

GENERAL ENGLISH-IV

Objectives:

- * To enable the students to comprehend the local and global issues through the lessons.
- * To enable the students to do the tasks centering on Skill Development and Grammar.
- * To empower the students with interactive skills.

Tasks Designed for Each Unit	Skills Focused to be Developed for Each Unit	Hours Allotted
1. Pre-reading Task	Listening and Reading Skills through teacher-led reading practice	2 Hours
2. Objectives	Listening and Reading Skills	
3. Text	Listening and Reading Skills through teacher-led reading practice	
4. Glossary (Using Words and Phrases in Sentences)	Referring and Language Using Skills	2 Hours
5. Reading Comprehension	Reading, Speaking, and Writing Skills	1 Hour
6. Critical Analysis	Critical Thinking and Speaking Skills	2 Hours
7. Creative Task	Creative Thinking and Speaking Skills	2 Hours
8. General Writing Skills	Writing Skill	1 Hour
9. Activities on Grammar	Grammar Using and Writing Skills	2 Hours

UNIT-I: Women through the Eyes of Media 12 Hrs

Grammar: Present Perfect Tense

UNIT-II: Effects of Tobacco Smoking 12 Hrs

Grammar: Present Perfect Continuous Tense

UNIT-III: The Impact of Liquor Consumption on the Society 12 Hrs

Grammar: Past Perfect Tense

UNIT-IV: An Engineer Kills Self as Crow Sat on his Head: A News Paper Report 12 Hrs

Grammar: Past Perfect Continuous Tense

UNIT-V: Traffic Rules 12 Hrs

Grammar: Future Perfect Tense & Future Perfect Continuous Tense

Text Book:

Jayraj, S. Joseph Arul. et al. (2014). *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*, New Delhi, Trinity.

Sem. IV
14UCH430207

Hours/Week: 6
Credits: 5

GENERAL CHEMISTRY-IV

Objectives

- To understand the chemistry of aromatic hydrocarbons
- To understand the chemistry of hydroxyl compounds, ether and thioethers
- To understand the chemistry of alkyl aryl halides
- To study the phase rule and its applications

Unit 1: Benzene (18 Hours)

General methods of preparation of benzene – molecular orbital picture – aromatic character – Huckel's rule of aromaticity (Benzenoid and non-benzenoid compounds)–Aromatic Electrophilic substitution Reactions of benzene: General Mechanism – Mechanism of Nitration, sulphonation, Halogenations, Friedel-Craft's Alkylation and Acylations- Orientation and Reactivity of mono- and di-substituted benzenes.

Unit 2: Alcohols, Phenols and ethers (18 Hours)

Nomenclature – Laboratory preparation of alcohols – Industrial source of alcohols – Physical properties – Chemical properties – Uses – Chemistry of glycols and glycerols – Uses - Pinacol – Pinacolone rearrangement–Preparation of Phenols – Physical and Chemical properties – Uses – Aromatic electrophilic substitution mechanism – Theory of Orientation and Reactivity - Preparation- Properties and Uses of Ethers and Thioethers– Introduction to Crown ethers – Structure – Applications in Phase Transfer Catalysis.

Unit 3: Alkyl and Aryl Halides (18 Hours)

Nomenclature – General methods of preparation of Haloalkanes – Physical properties – Chemical properties – Uses – Nucleophilic Substitution Mechanisms (SN_1 , SN_2 and SN_i) – Evidences – Stereochemical aspects of Nucleophilic substitution mechanisms – General methods of preparation of Halobenzenes - Physical properties – Chemical properties – Uses – Mechanisms of Electrophilic and Nucleophilic substitution reactions – Theory of Orientation and Reactivity.

Unit 4: Phase Rule I (18 Hours)

Phase rule – Meaning of the terms: Phase, Component, Degrees of freedom – Derivation of Gibbs phase rule – Reduced Phase rule – Phase diagrams of One component systems (Water, CO_2 , and Sulphur systems) - Thermal analysis, Application of Clapeyron-Clausius equation to water system.

Unit 5: Phase Rule II (18 Hours)

Phase diagrams of Two component systems solid-liquid equilibrium – Simple Eutectic - Bi-Cd system – Pb-Ag systems – Desilverisation of Lead – Phase diagram of system with compound formation with congruent melting point – Mg-Zn System – $FeCl_3$ -Water system – incongruent melting point – Na-K system – NaCl-Water system –Freezing mixture – Gas-Solid Equilibrium – $CuSO_4$ –Water system – Efflorescence – Deliquescence- Three-component system (Acetic acid-Chloroform-Water) only.

REFERENCE

1. Morrison R.T and Boyd R.N., Organic Chemistry,(4th edition), Allyn & Bacon Ltd., New York, (1976).
2. Bahl B.S and Arun Bahl, Advanced Organic Chemistry,(12th edition), Sultan Chand and Co., New Delhi,(1997) [Textbook]
3. Pine S.H, Organic Chemistry, (4th edition)McGraw- Hill International Book Company, New Delhi, (1986)
4. Puri B.R., Sharma L.R and Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), Shoban Lal, Nagin Chand & Co., New Delhi, (1993) [Textbook]
5. Lee J.D., Concise Inorganic Chemistry, Black well science, UK, (2006).
6. Puri B.R., Sharma L.R. and Pathania M.S., Principles of Physical Chemistry, (23rd edition), Shoban Lal, Nagin Chand & Co., New Delhi, (1993) [Textbook]
7. Negi A S and Anand S C, A Text book of Physical Chemistry, New Age International Publishers, New Delhi (1985).

Sem. IV
14UCH430301A

Hours/Week: 4
Credits: 4

Core Elective:
MATERIAL SCIENCE

Objectives

- To know the properties and uses of polymers
- To know the methods involved in the processing of rubber materials
- To learn about plastic materials

Unit I:

High Polymers -Introduction -Nomenclature -Functionality -Classification of Polymers -Homo and hetero chain polymers -Addition polymerization – Condensation polymerization –copolymerization, polymerization - Mechanism of Addition Polymerization-Cationic -Anionic polymerization - Free radical and Co-ordination or Ziegler-Natta polymerization-Effect of Heat on Polymers -Mechanical Properties of Polymers.

Unit II:

Polymers in Medicine and Surgery -Conducting Polymers -Some Physical and Mechanical Properties of Polymers-Crystallinity in Polymers.Effect of polymer structure and properties -Strength, plastic deformation-chemical resistance -Physical state of polymer -Glass Transition Temperature -Polymer Reaction.

Unit III:

Introduction to Rubber -Latex -Processing Latex -Mastication -Compounding of Rubber -Vulcanizations of Rubber -Engineering Polymers, Thermoforming -Degradation stability and environment.Synthetic rubbers -Preparation and applications of SBR -Butyl rubber -Nitrile rubber -Neoprene and Silicone rubber.

Unit IV:

Plastic Materials -Classification of Plastics (or Resins) -Moulding Constituents of a Plastic -Fabrication techniques used for thermoplastic resin (Moulding process).Important Thermoplastic Resins-Natural resins - Celluloses -Polyethylene -PVC.

Unit V:

Important thermosetting resins-Phenol Formaldehyde Resin or Pheonolic Resin -Amino Resins and Plastics -Epoxy Resins -Acrylic Resins and Plastics

-Polyester resins. Silicone Resins -Silicone fluids -Silicone greases – Polyurethane's -Foamed or cellular plastics.

Reference

1. Industrial Chemistry, B.K. Sharma, Industrial Chemistry, Goel publishing house, Meerut, 1997.

Sem. IV
14UCH430301B

Hours/Week: 4
Credits: 4

Core Elective:
HEALTH AND HYGIENE

Objectives

- To know and accept individual and collective responsibility for healthy living at home, school and in the community.
- To help students know their health status, identify health problems and be informed for taking appropriate remedial measures.
- To acquaint them with first-aid measures about common sickness and injuries.

Unit – I: Maintenance of Health

Concept of health and Hygiene and their relation to successful living. Food pyramid, Determinants of health, building of good health habits, immunization, correction of defects, maintenance of health records.

Unit – II: Physical Health

Care of skin, hair, teeth, eyes, ears, hand and feet, Rest and sleep, exercise, activity, recreation, posture, Food and nutrition, elimination, Hygiene of eating and drinking, menstrual hygiene.

Unit – III: Mental Health.

Characteristics of mentally healthy person, Mental hygiene in intrauterine, infancy, childhood, adolescence, adulthood and old age. Health destroying habits and addictions - Pan, Supari, Ganja, Drinking, Smoking.

Unit – IV: Common diseases and their treatment

Cancer – types, causes and their treatment, Water borne diseases-Jaundice, Malaria, Typhoid, Dysentery and their treatment. Fever, Headache, Vomiting and Ulcer- causes and their treatment.

Unit - V: First Aid

Introduction to First Aid, First Aid Equipment, The Unconscious, Casualty, Blood Loss and Shock, Burns, Fractures Head Injury, Sports Injuries, Moving, Handling & Transporting Casualties.

References

1. Cheryl Tillman, Principles of Occupational Health and Hygiene – an introduction, Allen & Unwin, Sydney, 2007
2. Fryer, Jane Eayre, First Aid Book, The John C. Winston Company.

Sem. III & IV
14UCH330208

Hours/Week: 3
Credits: 3

Chemistry Practical-III: PHYSICAL CHEMISTRY

Objectives

- To learn the fundamentals of conductometric and potentiometric titrations
- To understand the method of determination of critical solution temperature, transition temperature and rate constant
- To learn the instrumental techniques

Unit I: Introduction to Physical Chemistry Practical

Introduction – Theory of the practical – Critical solution temperature – Transition temperature – Heat of neutralization – Kinetics of ester hydrolysis and persulphate oxidation – Viscosity – Phase Diagram (simple eutectic) – polarimetry of inversion of sugar – potentiometry – Conductometry – Partition coefficient and Equilibrium constant – Calculation of parameters with units – Drawing Graphs – Handling of various equipments used in physical chemistry practical.

Unit II: Two Cycles of Experiments

Cycle 1

1. Critical Solution Temperature
2. Heat of Neutralization
3. Transition Temperature
4. Kinetics of Ester Hydrolysis
5. Conductometric Acid-Base Titration
6. Potentiometric Acid-Base Titration

7. Viscosity
8. Measurement of optical density
9. Measurement of O.D and Transmission.
10. Determination of $t_{1/2}$ of a radioactive nucleus

Cycle 2

1. Rast Method
2. Effect of impurity on Critical Solution Temperature
3. Partition Coefficient, Equilibrium constant of $KI + I_2 \leftrightarrow [KI_3]$
4. Kinetics of Persulphate-Iodide Reaction
5. Conductometric Precipitation Titration
6. Potentiometric Redox Titration
7. Phase Diagram (Simple eutectic system)
8. Kinetics of inversion of sucrose by polarimetry
9. Estimation of iron by colorimetry
10. Determination of Li^+ , K^+ and Ca^{2+} by flame photometry.

Unit III: Demonstration Experiments

1. Determination of Iron by colorimetry
2. Determination of pH of solid samples using pH meter
3. Determination of sodium and potassium by Flamephotometry.

REFERENCES

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & sons, (1997).
2. Daniels et al., Experimental Physical Chemistry, (7th edition), New York, McGraw Hill, (1970).
3. Findlay, A., Practical Physical Chemistry, (7th edition), London, Longman (1959).

Sem. IV
14UCH430404A

Hours/Week: 6
Credits: 5

**Allied:
PHYSICS-II**

Objectives

- To understand the knowledge of nuclear bomb and X-ray studies.
- For the study of electrostatics, student acquire knowledge about forces in electric field and their applications.
- To understand the knowledge of magnetic field in various conducting media
- To know the information regarding lasers and fiber optics in communication system.
- To know the different types of digital instruments in various electronic devices and digital computer.

Unit I : MODERN PHYSICS

Liquid drop model – nuclear fission - nuclear fusion – atom bomb-photo electric effect – Einstein’s photo electric equation – experimental verification – Compton effect –theory – X-ray diffraction – Bragg’s law – Bragg’s X-ray spectrometer – structure of KCl and NaCl crystal – Sommerfeld relativistic atom model.

Unit II : ELECTROSTATICS

Gauss law - proof – force between two point charges in vacuum – applications of Gauss law - electric field due to a line charge, an infinite plane sheet of charge, infinite charged conducting plate, charged spherical shell and charged sphere –Coulomb’s law from Gauss law – capacitors – parallel plate capacitor with dielectric and dielectric with varying thickness.

Unit III : MAGNETISM AND CURRENT ELECTRICITY

Magnetizing field - intensity of magnetization - flux density – deflection magnetometer – Tan A and Tan B simultaneous method – vibration magnetometer – absolute determination of M and H – hysteresis – energy loss in hysteresis - Ampere’s law – Biot – Savarts law – magnetic field due to straight conductor carrying current – magnetic field on the axis of a circular coil carrying current – magnetic field due to a solenoid – force between two parallel conductors – Post Office Box – Potentiometer – principle and measurement of resistance and current..

Unit IV : LASERS AND FIBER OPTICS

Atomic excitation - excitation by absorption-induced absorption - spontaneous absorption-spontaneous and induced emission - optical pumping-Ruby laser - He-Ne laser-applications of lasers-fiber optics-propagation of light in various media and in optical fiber- optical fiber and total internal reflection-numerical aperture - fiber optic communication-advantages – telephone system and optical fiber.

Unit V : DIGITAL ELECTRONICS

Binary number system – conversion of binary into decimal, decimal into binary - logic gates and Universal gates – NAND and NOR as a Universal building block – Boolean algebra – De Morgan’s theorem – flip flops: SR, Clocked SR, JK, D–type, T–type.

Books For Study

1. A. S. Vasudeva - Modern Engineering Physics, S. Chand and Company Ltd., 1988.
2. Cyclostyled Text.

Units	Book	Sections
I	1	2.2,2.3,5.4,6.10-6.13,9.10-9.13,9.17,15.7,15.8
II	1	2.2-2.5,3.1,3.2,3.7,3.8
III	1	3.2-3.4,3.15,3.16,1.2-1.4,1.7-1.10.
IV	1	8.2,8.3,8.8-8.15, 8.17, 8.20, 8.22, 8.24, 8.28, 8.34, 8.35
V	2	Cyclostyled text

Sem. IV
14UCH430404B

Hours/Week: 6
Credits: 5

**Allied:
BIOCHEMISTRY-II**

Sem. IV
14UCH430405A

Hours/Week: 2
Credits: 2

**Allied:
PHYSICS PRACTICALS**

Any 16 Experiments

1. Young's modulus – Non uniform bending – cantilever
2. Young's modulus – Cantilever
3. S.T. – Method of drops
4. S.T. – Capillary rise.
5. Viscosity – variable pressure head
6. Concave lens – f, R, ?.
7. Air wedge – Thickness of wire.
8. Newton' Rings R
9. Spectrometer – Solid prism
10. Spectrometer – Grating (Normal Incidence)
11. M1/M2 – Tan A and Tan B simultaneous method
12. Absolute determination of M and H.
13. P.O. Box – Temp. Coefficient
14. Potentiometer – Ammeter calibration
15. Potentiometer – R and ?.
16. Field along the axis of the coil
17. Sonometer – Frequency of turning fork
18. Junction diode characteristics
19. Zener diode characteristics.
20. Logic gates – IC's
21. Jolly's bulb

Sem. IV
14UCH430405B

Hours/Week: 6
Credits: 5

**Allied:
BIOCHEMISTRY PRACTICALS**

Sem. V
14UCH530209

Hours/Week: 3
Credits: 3

INORGANIC CHEMISTRY-I

Objectives

- To learn the general characteristics of d block elements and important compounds of them
- To learn the general characteristics of f block elements and important compounds of them
- To understand the basics and theories of coordination compounds
- To learn the basics of organometallic chemistry

Unit I:

Transition metals (d – block elements) (15 Hours)

First, second and third transition series - General characteristics – Metallic character, atomic and ionic radii – oxidation states, colour, complex formation, catalytic and magnetic properties-Non-stoichiometric compounds- Important compounds of transition metals: Ziegler – Natta catalyst. Prussian blue, Sodium nitro prusside, Turnbull's blue, Nickel DMG complex, Wilkinson's Catalyst- KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$.

Unit II:

Inner transition metals (f – block elements) (15 Hours)

Lanthanides: Properties of lanthanides. Electronic configuration – oxidation states – ionic radii, lanthanide contraction. Colour and magnetic properties. Extraction of mixture of lanthanides from monazite sand and separation of lanthanides. Uses of lanthanides.

Actinides: Sources of actinides – preparation of transuranic elements - Electronic configuration – oxidation states – ionic radii – Colour of ions – comparison with lanthanides. Extraction of thorium from monazite sand. Production and uses of plutonium.

Unit III:

Coordination chemistry I (15 Hours)

Coordination compounds – central metal ion – ligands-types of ligands– coordination number, oxidation numbers, and coordination sphere – Nomenclature isomerism (structural and stereo) - Werner's theory of complexes. EAN rule – Magnetic properties. VB theory- applications and limitations, Factors affecting stability of complexes.

Unit IV:**Coordination chemistry II (15 Hours)**

Crystal Field theory. Crystal field splitting in octahedral, tetrahedral and square planar fields – factors influencing the magnitude of crystal field splitting – CFSE calculations- magnetic properties and colour.

Labile and inert complexes- stepwise and overall stability constants - Reaction mechanism – substitution reactions in octahedral complexes - Acid hydrolysis: SN1 and SN2 mechanisms – mechanism of electron transfer reactions – inner sphere and outer sphere mechanisms – Two electron transfer reactions – Complementary and non- complementary reactions.

Unit V:**Coordination chemistry III (15 Hours)**

Chelate effect, Jahn-Teller Effect – trans effect – theories of trans effect – applications of trans effect. Introduction to organometallic chemistry and metal complexes of CO, NO and alkenes (Zeise's salt) [Bonding only]

REFERENCES

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co.,(1993) [Text Book]
2. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
3. Huheey J E, Keiter E A, Keiter R L and Medhi O K. Inorganic Chemistry: Principles of Structure and Reactivity, Fourth Edition, Pearson Education, New Delhi, 2006.
4. Atkins P, Overton T, Rourke J, Armstrong F and Weller M. Inorganic Chemistry, 5th Edition. Oxford University Press, 2011.

Sem. V
14UCH530210

Hours/Week: 5
Credits: 4

ORGANIC CHEMISTRY-I**Objectives**

- To learn the chemistry of carbonyl compounds
- To study the chemistry of carboxylic acids and their derivatives
- To study the chemistry of active methylene compounds
- To study the chemistry of organonitrogen compounds
- To know about synthetic polymers

Unit I:**Aldehydes and Ketones (13 Hours)**

Nomenclature – Laboratory preparation of aliphatic carbonyl compounds– Physical properties – Chemical properties – Uses – Molecular Orbital picture of Carbonyl group – Nucleophilic addition mechanism at carbonyl group – Condensation reactions– Bechmann rearrangement - Acidity of alpha-hydrogen – General methods of preparation of aromatic carbonyl compounds – Physical and Chemical properties – Uses – Effect of aryl group on the reactivity of carbonyl group- Perkin, Knoevenagel condensations, Cannizzarro reaction.

Unit II:**Carboxylic Acids and their derivatives (13 Hours)**

Nomenclature – General methods of preparation of carboxylic acids (including Arndt-Eistert synthesis) – Physical properties – Structure and acidity – Chemical properties – preparation of dicarboxylic acid – Physical and Chemical properties – Uses.

Introduction to Derivatives of Carboxylic acids – nucleophilic substitution mechanism at acyl carbon –Acyl chlorides, Anhydrides, Esters, Amides- Hofmann, Curtius, Lossen and Schmidt rearrangements - Introduction to oils and fats – Fatty acids – soaps and detergents and mechanism of their cleansing action.

Unit III:**Active-Methylene Compounds (13 Hours)**

Introduction – Preparation of malonic ester – Physical and Chemical properties – Synthetic applications – Preparation of ethyl acetoacetate – Physical and Chemical properties – Synthetic applications – Introduction to

α,β -unsaturated carbonyl compounds – Electrophilic and Nucleophilic addition mechanisms across the $-C=C-$, Nucleophilic addition mechanism across the $-C=O$ – Michael addition- synthetic uses.

Unit IV:

Organo Nitrogen Compounds (13 Hours)

Nomenclature – Preparation of Nitro compounds – Physical and Chemical Properties – Uses – Preparation of Amino compounds – Physical and Chemical Properties – Uses – Electrophilic substitution mechanism – orientation and reactivity - Preparation of Diazonium salts — Chemistry of Phenyl hydrazine – Uses.

Unit V:

Synthetic polymers (13 Hours)

Rubber as a natural polymer – Types of polymers – homopolymers – copolymers – addition and condensation polymers - polymerization reactions – Mechanisms of cationic, anionic and free radical polymerization reactions – Condensation polymerization – Chemistry of Vulcanization of rubber – Manufacture of Film sheets, Rayon and Polyacrylic fibers -Uses of Polymers.

Reference

1. Finar I. L, Organic Chemistry, Vol 1&2, (6th edition) England, Addison Wesley Longman Ltd. (1996).
2. Morrison R.T, Boyd R.N., Organic Chemistry, (7th edition) New York, Allyn & Bacon Ltd., (2011).
3. Bahl B.S, Arun Bahl, Advanced Organic Chemistry, (12th edition) New Delhi, Sultan Chand and Co., (1997) [Textbook]
4. Pine S. H, Organic Chemistry, (4th edition) New Delhi, McGraw-Hill International Book Company (1986).

Sem. V
14UCH530211

Hours/Week: 4
Credits: 4

PHYSICAL CHEMISTRY-I

Objectives

- To learn the properties of solutions and fundamentals of solid state.
- To understand the applications of electrolytic conductance and electromotive force.
- To study the structure of molecules based on physical properties.

Unit I: Properties of Solutions (12 Hours)

Ideal binary liquid mixtures – liquid – liquid mixture (Benzene and Toluene) – Raoult's law and Henry's law – activity and activity coefficients – Fractional distillation of binary miscible liquid – Non-ideal systems – Azeotropes – HCl and water system – Ethanol and water system.

Partially miscible binary liquid systems: Phenol and water – Triethylamine and water – Nicotine and water – lower and upper CST's – Immiscible liquid – Nernst distribution – Principle and applications of steam distillation.

Dilute solutions and colligative properties: Determination of molecular weight – relative lowering of vapour pressure – Elevation of boiling point – Depression of freezing point – Thermodynamic derivation – Abnormal molecular mass – Van't Hoff factor – Degree of dissociation and degree of association of solutes.

Unit II: Solid state (12 Hours)

Isotropic and anisotropic solids – Interfacial angle – symmetry elements in crystal systems – Bravais lattices - Unit cell – law of rational indices (Weiss indices), Miller indices – unit cell dimension – density – number of atoms per unit cell – X-ray diffraction by crystals – derivation of Bragg's equation – Experimental methods of X-ray study- rotating crystal method – X-ray pattern by powder method - crystal structure of KCl, NaCl, ZnS, CsCl – Radius ratio and packing in crystal – Determination of Avogadro number – Vitreous state.

Unit III: Electrical conductance (12 Hours)

Ohm's law – conductance in metals and electrolytic solution – Specific conductance – equivalent conductance - Measurement of equivalent conductance using Kohlrausch law and its applications – Arrhenius theory of electrolytic dissociation and its limitations – Weak and strong electrolytes according to Arrhenius theory - Ostwald's dilution law, its uses and its

limitations - the elementary treatment of Debye Huckel theory of strong electrolytes - Transport number – Determination of transport number, Hittorf's method and moving boundary method – Applications of conductance measurements: Determination of degree of dissociation – determination of K_a of acid – Determination of solubility of sparingly soluble salt – common ion effect – conductometric titrations (acid –base and precipitation).

Unit IV: Electromotive force (12 Hours)

Electro chemical cells – electrolytic cell – Reversible and irreversible cells – Conventional representation of electrochemical cells – EMF and its measurements – Weston- Cd standard cell – computation of cell EMF - Relation between free energy and EMF – Gibbs Hemholtz equation and EMF – Calculations of thermodynamic quantities of cell reaction (ΔG , ΔH , ΔS and K) - Nernst equation – Types of reversible electrodes – Gas/Metal ion – metal /metal ion – metal/insoluble/anion - red ox electrodes – Electrode reaction – Nernst equation of electrode reaction – Derivation of cell EMF – single electrode potential –reference electrodes – standard hydrogen electrode –Standard electrode potential - sign conventions - Electrochemical series and its significance – concentration cell with and without transport number – Liquid Junction Potential – Application of EMF measurements – valency of ions, solubility product, activity coefficient, Potentiometric titration – Determination of pH using hydrogen, Quinhydrone and glass electrodes – Determination of pKa of acids by potentiometry.

Unit V: Physical Properties and Chemical Structur (12 Hours)

Polarization of molecules in an electric field – Polarizability and dipole moment – Induced and orientation polarization – Clausius Mosotti equation – measurement of molar polarization – Dipole moment – Measurement of dipole moment in solution (using Debye equation and dilute solution methods) – dipole moment of diatomic and poly atomic molecules – Bond moments – Lorenz-Lorentz equation – Applications of dipole moment measurements – determining the percentage of ionic character of bonds- shapes of simple molecules like BCl_3 , H_2O , CO_2 , NH_3 , CCl_4 – Dipole moments of substituted benzenes – *o*, *m* & *p*-dichlorobenzenes.

Reference

1. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal, Nagin Chand & Co., (1993) [Textbook]
2. Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press, London (1994).

Sem. V
14UCH530302A

Hours/Week: 4
Credits: 3

Core Elective:
SELECTED TOPICS IN PHYSICAL CHEMISTRY

Objectives

- To learn the basics of physical methods.
- To understand about thermo chemistry.
- To understand about acids and bases.
- To understand about adsorption and colloids.
- To know the fundamentals and applications of radiation chemistry.

Unit I:

Analytical methods III (12 Hours)

Fundamentals and instrumental techniques for – critical solution temperature, heat of neutralization, transition temperature, kinetics of ester hydrolysis, persulphate-iodide, inversion of sucrose by polarimetry, conductometric and potentiometric acid-base and redox titrations, viscosity, rast method, partition coefficient and phase diagram.

Unit II:

Thermo chemistry (12 Hours)

Change of internal energy-change of enthalpy in chemical reaction-exothermic and endothermic reactions- relation between heats of reaction at constant volume and pressure- standard enthalpy changes of reactions-determination- Kirchoff equation- Hess's law- applications- bond energies-applications.

Unit III:

Acids and Bases (12 Hours)

Dissociation of weak acids and bases-pH scale – common ion effect- buffer solution-buffer action- Henderson equation- Hydrolysis of salts- its determination – acid base indicators – theories of acid base indicators-solubility product and its applications.

Unit IV:

Colloids (12 Hours)

Colloidal systems – classification-preparation – purification-properties-determination of size of particles- surfactants- micelle formation – solubilization- micellar catalysis- emulsification – micro emulsions- gels and their preparation.

Unit V: Radiation Chemistry**(12 Hours)**

Introduction to radiation chemistry – Primary and secondary process – radiolysis of water – hydrated electrons – Radiolysis of Fricke dosimeter solution – radiation dosimetry- industrial applications of radiation- processing of polymers-sterilisation of medicinal products- conservation of environment- applications of radio isotopes in health care.

REFERENCES

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & Sons (1997).
2. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993) [Textbook]
3. Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press, London (1994).
4. Sood D.P., Reddy A.V.R., Rama moorthy N., Fundamentals of Radio Chemistry, Indian Association of Nuclear Chemists and Allied Scientists, Mumbai (2000).

Sem. V**14UCH530302B****Hours/Week: 4****Credits: 3****Core Elective:
SELECTED TOPICS IN CHEMISTRY-I****Objectives**

- To learn the basics of Green chemistry
- To learn the basics of nano chemistry.
- To know the fundamentals of nuclear magnetic resonance
- To understand about mass spectrometry
- To know the fundamentals and applications of statistical thermodynamics.

Unit I:**Green Chemistry**

Need- principles- planning of green synthesis- examples of green reactions from condensation, oxidation, reduction, rearrangement and addition reactions- microwave and sonication reactions.

Unit II:**Nano chemistry**

Introduction – nano and nature-Preparation of nano materials- characterization of nano materials by SEM and TEM- Carbon nano tubes- applications of nano materials in biology, sensors, medicines.

Unit III:**Nuclear magnetic spectroscopy**

Spin angular momenta-magnetic moments- instrumentation- chemical shifts-spin –spin coupling- simple applications.

Unit IV:**Mass spectroscopy**

Instrumentation – Base peak, isotopic peaks, metastable peak, parent peak, determination and use of molecular formula, recognition of molecular ion peak . Fragmentation – General rules – Pattern of fragmentation for various classes of compounds, McLafferty rearrangement, Importance of metastable peaks.

Unit V:**Statistical Thermodynamics**

Permutations and combinations-Combinatory rule - probability theorems. -

Microstates, macrostates - Methods of counting microstates of distinguishable and indistinguishable particles-Phase space-Thermodynamic probability-Statistical equilibrium-. Maxwell--Boltzmann statistics -Derivation of M.B. statistics-Relationship between entropy and probability-Statistical meaning of third law of thermodynamics.

References

1. Ahluwalia V. K. Green Chemistry, Ane Books Ltd., Chennai (2009).
2. Padeep T, Nano: The Essentials, Tata McGraw- Hill Pub. Co. Ltd., New Delhi (2009).
3. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
4. Atkins P.W, Physical Chemistry, (5th edition) Oxford University Press, London (1994).
5. Kuriakose. J.C. and Rajaram J.C. Thermodynamics Jalandar Shoban Lal Co., New Delhi (1996).
6. Gupta M. C., Statistical Thermodynamics, Wiley-Eastern Limited, Madras (1997).

Sem. V
14UCH540601

Hours/Week: 2
Credits: 2

Interdisciplinary Skill Based Course: FOOD AND NUTRITION

Objectives

- To learn the importance of food and nutrition.
- To know the chemical composition and importance of balanced diet.
- To learn the food adulterants and identification of them.
- To know the health problems associated with food adulteration.

Unit I: Food, nutrition and health (6 Hours)

The meaning of food, nutrition, nutritional care and health-nutritional problems in India.

Unit II: Biological importance of food (6 Hours)

Nutritional classification of food-nutrients as body constituents-digestion and absorption of food. Types of food, caloric content and dieting.

Unit III: Basic chemical constituents of food (6 Hours)

Biological functions of carbohydrates, proteins, fats, vitamins, minerals and water.

Unit IV: Food adulteration testing (6 Hours)

Common adulterants in food-testing methods of all food adulterants.

Unit V: Health problems of food adulteration (6 Hours)

Principal adulterants and their health effects.

REFERENCES

1. Alex Ramani V, Food Chemistry, MJP Publishers, Triplicane, Chennai, 2009.
2. Thangamma Jacob, Food adulteration, Macmillan company of India limited, New Delhi, 1976.
3. Jeyaraman J, Laboratory manual in biochemistry, Wiley Eastern limited, New Delhi, 1981.

Sem. V
14USS540701

Hours/Week: 2
Credits: 2

IDC:
SOFT SKILLS

Objectives

* This course is aimed at introducing the students to the nuances of developing the basic skills that required of an educated youth; and to train them to present the best of themselves as job seekers.

Module 1: Effective Communication & Resume Writing

Basics of communication - definition of communication, Barriers of Communication, Non-verbal Communication; Effective Communication - Johari Window, The Art of Listening, Conversation Techniques, Good manners and Etiquettes.

Module II: Resume Writing & Interview skills

Resume Writing: What is resume? Types of Resume - Chronological, Functional and Mixed Resume, Steps in preparation of Resume. Interview Skills: Common interview questions, Attitude, Body Language, The mock interviews, Phone interviews, Behavioral interviews.

Module III: Group Discussion

Group Discussion Basics, GD Topics for Practice, Points for GD Topics. Personal Effectiveness: Self Discovery; and Goal Setting

Module IV: Numerical Ability

Average, Percentage; Profit and Loss, Simple Interest, Compound Interest; Time and Work, Pipes and Cisterns; Time and Distance, Problems on Trains, Boats and Streams; and Calendar, Rations and Proportions.

Module V: Test of Reasoning

Verbal Reasoning: Series Completion, Analogy; Data Sufficiency, Assertion and Reasoning; and Logical Deduction. Non-Verbal Reasoning: Series; and Classification

References

1. Aggarwal, R.S. 2010. A Modern Approach to Verbal and Non Verbal Reasoning. S.Chand, New Delhi.
2. Covey, Stephen. 2004. 7 Habits of Highly effective people, Free Press. Egan, Gerard. (1994). The Skilled Helper (5th Ed). Pacific Grove, Brooks/ Cole.

3. Khera, Shiv 2003. You Can Win. Macmillan Books , Revised Edition.
4. Murphy, Raymond. 1998. Essential English Grammar. 2nd ed., Cambridge University Press. Sankaran, K., & Kumar, M. Group Discussion and Public Speaking. M.I. Pub, Agra, 5th ed., Adams, Media.
5. Trishna's 2006. How to do well in GDs & Interviews, Trishna Knowledge Systems.
6. Yate, Martin. 2005. Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting.

Sem. VI
14UCH630216

Hours/Week: 4
Credits: 4

INORGANIC CHEMISTRY-II

Objectives

- To learn the concept of metallic bonding
- To learn the concept of ionic bonding
- To learn the concept of covalent bonding
- To understand gravimetric and thermogravimetric analysis
- To know the basics of colorimetry and chromatography.

Unit I:

Covalent Bond (12 Hours)

Lewis theory – octet rule and its exceptions, electron dot structural formula. Sidwig – Powell theory- prediction of the molecular shapes. Valence Bond theory – Hybridization and geometry of molecules. VSEPR theory and model – Illustration of CH_4 , H_2O , NH_3 , SF_4 , XeF_2 , XeF_6 . MO theory: LCAO method, criteria of orbital overlap, types of molecular orbitals (sigma and pi). Qualitative MO energy level diagram of homo and hetero diatomic molecules H_2 , He_2 , N_2 , O_2 , and CO , bond order and stability of molecules.

Unit II:

Ionic Bond (12 Hours)

Properties of ionic compounds – Factors favouring the formation of ionic compounds (Ionization energy, Electron affinity, Electro negativity and Lattice energy) - Lattice energy – definition, Born – Lande equation (Derivation not required), factors affecting lattice energy- Born – Haber cycle – Illustration and calculation only for MX (general and NaCl) and MX_2 . Fajan's rules with illustrations.

Unit III:

Metallic Bond (12 Hours)

Properties of metals, free electron theory, band theory explaining the properties of metals, semiconductors and insulators- Stoichiometric and non-stoichiometric defects and their applications. Superconductors – introduction, BCS theory and applications.

Unit IV:

Gravimetry and Thermal Analysis (12 Hours)

Gravimetric analysis: mechanism of precipitation – solubility products –

common ion effect – Types of precipitation – co-precipitation and post precipitation – homogeneous precipitation.

Thermal Analysis: Principle, Instrumentation and applications of TGA, DTA and DSC

Unit 5:

Colorimetry and Chromatography (12 Hours)

Colorimetric analysis: Beer-Lambert law applications and limitations- principles of spectrophotometry - Chromatographic Techniques: Principle, instrumentation and applications of ion-exchange, HPLC and gas chromatographic techniques.

REFERENCE

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., New Delhi (2010) [Text Book]
2. Mendham J, Denny R C, Barnes J D and Thomas M J K, Vogel's Text book of quantitative chemical analysis, 6th Edition, Prentice Hall, London (2000).
3. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
4. Huheey J E, Keiter E A, Keiter R L and Medhi O K. Inorganic Chemistry: Principles of Structure and Reactivity, Fourth Edition, Pearson Education, New Delhi, 2006.
5. Atkins P, Overton T, Rourke J, Armstrong F and Weller M. Inorganic Chemistry, 5th Edition. Oxford University Press, 2011.

Sem. VI
14UCH630217

Hours/Week: 5
Credits: 5

ORGANIC CHEMISTRY-II

Objectives

- To learn the chemistry of organometallic compounds
- To learn about UV-Visible spectroscopy
- To know the applications of IR spectroscopy to organic chemistry
- To learn the applications of NMR and Mass spectrometry in organic chemistry
- To apply spectral data to assign the structure of organic compounds.

Unit I: Organometallic Reagents (15 Hours)

Introduction to organometallic reagents - Preparation of organometallic reagents with metals like – Mg, Cu, Li, Zn, Se, Si, Pd and their synthetic applications.

UNIT II: UV-Visible Spectroscopy (15 Hours)

Electromagnetic spectrum – Energy-Wavelength relationship – Introduction to UV-VIS spectroscopy – Beer-Lamberts Law – simple instrumentation – Bands in UV-VIS spectrum – Possible electronic transitions – Types of electronic transitions based on selection rules – Characteristic absorption (λ_{max} and ϵ_{max}) of $>C=O$, $>C=C<$, $>C=C-C=C<$, $>C=C-C=O$, Aryl groups – Factors influencing the absorption – Some terms: Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift, Hypochromic shift, Hyperchromic shift- Solvent Correction-Woodward-Fisher method to calculate λ_{max} of dienes and $>C=C-C=O$ compounds.

Unit III: IR Spectroscopy (15 Hours)

IR: Introduction to IR spectroscopy – Hooke's Law – simple instrumentation – bands in IR spectrum – possible vibrations in organic molecules – Selection rule – Characteristic absorptions (λ_{max}) of various bond vibrations – Factors influencing the absorption - Interpreting typical UV-VIS and IR spectra of some organic compounds: hydrocarbons (saturated & unsaturated)- Organohalogens - organochalcogens and organonitrogens- differentiating H-bonding in IR spectrum.

Unit IV: NMR Spectroscopy (18 Hours)

Magnetically active nuclei – simple instrumentation – signals in NMR spectrum – Chemical shift – characteristic chemical shift values of various

protons and carbons – number splitting and area of the peaks – coupling constants – interpreting the NMR spectra of some organic molecules – introduction to ^{13}C NMR spectroscopy- types of carbons and their signals and splitting only - ESR spectroscopy: Principle and applications to methyl and naphthyl radicals.

Unit V: Mass Spectrometry (15 Hours)

Principle of mass spectrometry – simple instrumentation – Fragmentation pattern – m/z values of various fragments – Nitrogen rule – McLafferty rearrangement - Interpreting the mass spectra of some organic molecules. Combined approach to identify the structure of organic molecules of simple molecules.

REFERENCES

1. Finar I.L., Organic Chemistry Vol 1&2, (6th edition) England, Addison Wesley Longman Ltd.(1996)
2. Morrison R.T, Boyd R.N., Organic Chemistry, (6th edition) New York, Allyn & Bacon Ltd., (1996).
3. Bahl B.S, Arun Bahl, Advanced Organic Chemistry, (12th edition) New Delhi, Sultan Chand and Co., (1997) [Textbook]
4. Pine S. H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill International Book Company. (1986)
5. Kalsi. L., Organic Spectroscopy, New Delhi, New Age International Company (1998).
6. Seyhan N. Ege, Organic Chemistry, New York, Houghton Mifflin Co., (2004).
7. Sharma Y R, Elements of Organic Spectroscopy, S Chand Publishers, New Delhi (2010).

Sem. VI
14UCH630218

Hours/Week: 4
Credits: 4

PHYSICAL CHEMISTRY-II

Objectives

- To learn the fundamentals of spectroscopic techniques
- To study the rate and mechanisms of chemical reactions
- To understand homogeneous and heterogeneous catalysis

Unit I:

Spectroscopy I (12 Hours)

Electromagnetic radiation, quantisation of energies in molecules (Translational, rotational, vibrational and electronic) – Microwave spectroscopy – condition – molecular rotation – theory of microwave spectroscopy – selection rule – effect of isotopic substitution – Calculation of μ and bond length of diatomic molecules.

UV visible spectroscopy – conditions – theory of electronic spectroscopy – types of electronic transitions – Frank-Condon principle – Predissociation – Dissociation energy – Applications.

Unit II:

Spectroscopy II (12 Hours)

Infrared spectroscopy – condition – molecular vibration – modes of vibration of linear and Non-linear molecules – Diatomic CO_2 , H_2O – stretching and bending vibrations – selection rules – calculation of force constant – isotope effect – Applications of IR spectra – (Group frequencies, finger printing and Hydrogen bonding only).

Raman spectroscopy – condition – Raleigh and Raman scattering – Stokes and Anti-stokes lines – Difference between Raman and IR spectroscopy – Rotational Raman spectra – Application to covalent compounds – Mutual exclusion principle.

Unit III:

Chemical Kinetics I (12 Hours)

Rate of reaction – rate laws – rate constant – order and molecularity of reactions – Factors influencing the rate of a reaction – Derivations of rate constants for Zero, first and second order reactions – Fractional order reactions – Half-life period – Pseudo first order reactions and examples – Methods of determination of order of a reaction (Integration, graphical, half-life, Oswald's dilution method, experimental).

Unit IV:

Chemical Kinetics II (12 Hours)

Steady state approximation - Chain reactions and explosion reaction - Temperature dependence of reaction rates – Arrhenius parameters. Theories of reaction rates – simple collision theory – limitations - Lindmann's hypothesis of unimolecular reactions – Theory of absolute reaction rates – influence of ionic strength on reaction rate.

Unit V:

Chemical Kinetics III (12 Hours)

Homogeneous and Heterogeneous catalysis – Acid-base catalysis, enzyme catalysis – Michaelis Menten equation – Adsorption of Gas by solids – unimolecular surface reaction – Bimolecular surface reaction.

Note: Numerical problems wherever possible.

REFERENCES

1. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993) [Textbook]
2. Atkins P.W., Physical Chemistry, (7th edition) Oxford University Press, London (2009).
3. Castellan G.W., Physical Chemistry, Third Edition, New Delhi, Orient Longmann (1987).

Sem. VI
14UCH630303A

Hours/Week: 4
Credits: 4

Core Elective:
CHEMISTRY OF BIOMOLECULES

Objectives

- To learn the chemistry of sugars
- To learn the chemistry of amino acids
- To learn the chemistry of proteins, nucleic acids vitamins and antibiotics
- To understand the chemistry of alkaloids
- To understand the chemistry of terpenoids.

Unit 1:

Sugars (12 hrs)

Introduction – Classification – Nomenclature – Physical properties- Glucose -Cyclic structures – Chemical properties – Mutarofataion – Anomerism – Epimerization –Kiliani-Fischer Synthesis – Ruff Degradation – Fructose-cyclic structures-Interconversion of ketose to aldose – Conversion of glucose into ascorbic acid– only structures of disaccharides: lactose, maltose, cellobiose, sucrose – Structure - Uses –Cellulose – properties – Structure.

Unit 2:

Amino acids and Proteins (12 hrs)

List of amino acids – Structures - Preparation of amino acids – Reactions of amino acids -synthesis of peptides: Protection, Activation and deprotection of N- and C- terminals – protecting and deprotecting agents- role of DCC - and Merrifield solid phase synthesis– Definition – Classification of proteins - Terminal Residue analysis: N-terminal (Fredrick Sanger and Edman Pehr methods) – C-terminal analysis- Overlap method for protein sequence - Structure of proteins – primary, secondary and tertiary structures of proteins- tests for proteins

Unit 3:

Heterocyclics (12 hrs)

Introduction – Nomenclature –Synthesis of Pyrrole, Furan and Thiophene – Molecular orbital pictures – Preparation of Pyrrole – Physical and Chemical properties – Uses – Electrophilic substitution mechanism – Preparation of Furan and Thiophene – Physical and Chemical properties – Uses – Laboratory preparation, structure, Physical and Chemical properties and

uses of Indole, Pyridine, Quinoline – Electrophilic and Nucleophilic substitution reactions mechanisms.

Unit IV: (12 Hours)

Nucleic acids

Types of bases – Types of sugars – Nucleosides and Nucleotides – Types of nucleic acids - Structure and functions of DNA and RNA.

Vitamins and Antibiotics

Vitamins – Types – Sources and deficiency disorders – Antibiotics – structure and functions of chloramphenicol, penicillins, streptomycin, tetracyclins – Definition of disinfectants, antiseptics, antipyretics, analgesics and antimalarials.

Unit V:

Alkaloids, Steroids and Terpenoids (12 Hours)

Introduction to Alkaloids – Classification – Occurrence and Isolation – Structural elucidation of piperine only – Only Structures of alkaloids: Quinine, Morphine, Atropine, Nicotine, Coniine, Piperine and Papaverine - Only Structure and functions of steroids-Androgen, Esterogen and cholesterol- Classification of terpenoids – definition, classification, isoprene rule- Structure and uses of some essential oils- Structural elucidation of geraniol only.

REFERENCES

1. Finar I.L, Organic Chemistry Vol 2, (6th edition) England, Addison Wesley Longman Ltd. (1996).
2. Morrison R.T, Boyd R.N., Organic Chemistry, (4th edition) New York, Allyn & Bacon Ltd.,(1976).
3. Bahl B.S, Arun Bahl, Advanced Organic Chemistry, (12th edition) New Delhi, Sultan Chand and Co., (1997).
4. Jeyashre Ghosh, A Text book of Pharmaceutical Chemistry, Tata McGraw Hill Publishing, New Delhi (1993).

Sem. VI
14UCH630303B

Hours/Week: 4
Credits: 4

Core Elective:

PHARMACEUTICAL CHEMISTRY

Objectives

- To know drugs Acting on Central Nervous System
- To know analgesics and antiseptics
- To know the drugs acting on central nervous system
- To know cardiovascular agents

Unit – I: Drugs Acting on Central Nervous System - I

General Anaesthetics: Intravenous anaesthetics, mechanism of anaesthetic action. Hypnotics and Sedatives: Classification, chemistry, pharmacological actions, pharmacokinetics and adverse effects of barbiturates, benzodiazepines, BZD antagonist.

Unit – II: Analgesics and Antiseptics

Opioid Analgesics: Morphine and codeine and their synthetic modifications, opioid antagonists. Antiepileptics: Epilepsies, Classification, chemistry, treatment of epilepsies.

Unit – III: Drugs Acting of Central Nervous System - II

Antiparkinsonism drugs: Dopamine replacements, dopamine releasers, dopamine agonists. Anticonvulsant Drugs: Barbiturates, hydantoins, oxazolidinediones, succinimides.

Unit – IV: Psychotropic and pharmacological Agents

Antipsychotic Drugs: Psychosis, classification, mechanism of actions, adverse effects.

Antianxiety Drugs: Anxiety, classification, treatment of anxiety.

Antidepressants: MAO inhibitors, classification, mechanism of action of tricyclic and related Antidepressants.

Antamanic Drugs: Mechanism, pharmacokinetics and control of therapy.

Hallucinogens: Introduction of indoleamines and cannabinoids.

Unit – V: Cardiovascular Agents - I

CNS–Stimulants: Classification and introductory ideas of different classes, cognition enhancers.

Antianginal Agents and Vasodilators: Intermediary myocardial metabolism, nitrovasodilators metabolism and antianginal action, calcium antagonists.

REFERENCE

1. Jeyashree Ghosh, A Text book of Pharmaceutical Chemistry, Tata McGraw Hill Publishing, New Delhi (1993).

Sem. VI
14UCH630304A

Hours/Week: 3
Credits: 3

Core Elective:

SELECTED TOPICS IN CHEMISTRY-II

Objectives

- To study the concepts of acids, bases and non-aqueous solvents
- To learn alloys and other inorganic polymers
- To understand the significance and role of metal ions in biological systems
- To study the fundamentals of photochemistry
- To study the fundamentals of adsorption and group theory

Unit I: Acid-Base Chemistry and Non-aqueous solvents (9 Hours)

Acid Base Chemistry: Theories of acids and bases – Arrhenius, Bronsted-Lowry, Lewis, Lux Flood and Usanovich and Solvent system concept. HSAB principle

Non-aqueous solvents: Classification of solvents – Water and liquid ammonia as solvents.

Unit II: Bio-inorganic Chemistry (9 Hours)

Metal ion in biology and their vital role in the active site, Structure and functions of Metallo proteins and enzymes. Ion transport mechanism in cell membrane – Na and K pumps- Ionophores – Structures and characteristic features of Haemoglobin and myoglobin – Vitamin B₁₂.

Unit III: Alloys and Inorganic Polymers (9 Hours)

Mechanical properties of materials and change with respect to temperature – Materials of constructions used in industry. Important alloys of iron, copper, Aluminium & Nickel. Manufacture; settings of cement. Manufacture & Types of glass. Inorganic Polymers – General properties- Glass transition temperature – Maddrell's salt – Kuroll's salt – polymeric sulphur nitride – silicon rubber – silicon resins.

Unit IV: Photochemistry and Adsorption (9 Hours)

Photochemical reaction – Laws of photochemistry – quantum yield – primary and secondary process – HI decomposition – HBr decomposition – kinetics of hydrogen- bromine reaction - kinetics of hydrogen- chlorine reaction – Photochemical equilibrium - photodimerisation of Anthracene – Photosensitisations – Chemiluminescence – Phosphorescence.

Adsorption - heat of adsorption – factors influencing adsorption- physisorption and chemisorptions- Langmuir's theory of adsorption,- Freundlich's isotherm- Gibbs adsorption isotherm for adsorption from solutions.

Unit V: Group theory (9 Hours)

Symmetry elements and operations-properties of a group-Abelian group-cyclic group- point groups of molecules (C_n , C_{nv} , C_{nh} , D_{nh} , D_{nd} and linear molecules)- optical activity and dipole moment on the basis of symmetry.

References

1. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
2. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
3. Raman K V, Group Theory and its Applications to Chemistry, New Delhi, TATA McGraw Hill Co., (1990).

Sem. VI
14UCH630304B

Hours/Week: 4
Credits: 4

Core Elective:

SELECTED TOPICS IN CHEMISTRY-III

Objectives

- To know the advances in photochemistry
- To know the different types of pi bonding in inorganic compounds
- To study the structure and properties of electron deficient non-metal halides
- To know the basics of green chemistry.

Unit I: Fundamentals concepts in photochemistry (12 Hours)

Fundamental concepts in photochemistry – Jablonskii diagram – photosensitization – photochemical reactions – comparative study of Norrish Type I and Type II reactions.

Unit II: Fundamentals of Pericyclic Reactions (12 Hours)

Fundamental concepts of pericyclic reactions – characteristics – types – application of FMO and MO correlation diagram methods to electrocyclic and cycloaddition reactions – Woodward-Hoffmann rules.

Unit III: Use of p and orbitals in bonding (12 Hours)

Use of p-orbitals in p bonding – use of d orbitals by non-metals – experimental evidence of pp-pp, pp-dp bonding – evidence of d orbital contraction and participation

Unit IV: Electron Deficient Compounds (12 Hours)

Acidity of boron trihalides – carbon and silicon tetrahalides
Concept of 3-centred 2-electron bonds in electron deficient molecules – complex boron hydrides – Wade's rules. Color of transition metal compounds and complexes

Unit V: Green Chemistry (12 Hours)

Introduction and basic principles of green chemistry – tools of green chemistry – green solvents – green reactions – microwave induced green synthesis – nanotechnology – synthesis of carbon nanotubes – types properties and uses

REFERENCES

1. Depuy C H and Chapman, Molecular reactions and Photochemistry, Prentice-Hall of India, New Delhi, 1988
2. Huheey J E, Keiter E A, Keiter R L and Medhi O K. Inorganic Chemistry: Principles of Structure and Reactivity, Fourth Edition, Pearson Education, New Delhi (2006).
3. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006)
4. Anastas P T and Warner J C, Green Chemistry – Theory and Practice, Oxford University Press, New York, 1988.

Sem. VI
14UCH640602

Hours/Week: 2
Credits: 2

Interdisciplinary Skill Based Course-II:
EVERYDAY CHEMISTRY

Objectives

- To know the chemistry of water
- To study the applications of industrially important compounds
- To study the different types of fuels
- To study the importance of drugs
- To understand the need of biological chemistry

UNIT I: Chemistry of water (6 Hours)

Impurities in water – Hardness and its disadvantages – Prevention of scale formation (softening of water) – Potable water (water for domestic supply).

UNIT II: Industrial Chemistry (6 Hours)

Cement – Manufacture of Portland cement – Special cements – Mortars and Concretes.

Rubber – Vulcanization – Uses of rubber.

Explosives – Classification of Propellants and Rocket fuels – Properties of a good propellant.

UNIT III: Fuels (6 Hours)

Coal – Classification of coal.

Petroleum – Origin – Classification – Refining – Cracking – Knocking – Leaded Petrol.

Diesel oil – Non petroleum fuels – Natural gas – Liquid Petroleum Gas (LPG).

UNIT IV: Pharmaceutical Chemistry (6 Hours)

Drugs – Nature, Source and study of drugs – Classification of drugs.

Anesthetics – Antiseptics – Disinfections – Antibiotics – Preservatives – Antioxidants.

UNIT V: Biological Chemistry (6 Hours)

Vitamins – Fat and Water soluble – Physiological functions.

Chemistry of Oils, Soaps and Detergents.

Clinical chemistry – presence of glucose in blood and urine – Cholesterol in urine diabetes – anemia – blood pressure.

REFERENCES

1. Krishnamurthy. N., Jayasubramanian. K and Vallinayagam, Applied Chemistry, Prentice Hall of Inida, New Delhi (1990).
2. Jeyashre Ghosh, A Text book of Pharmaceutical Chemistry, Tata McGraw Hill Publishing, New Delhi (1993).

Sem. V & VI
14UCH630216

Hours/Week: 4
Credits: 4

Chemistry Practical-IV
GRAVIMETRY AND ORGANIC PREPARATION

Objectives

- To learn the techniques of gravimetric analysis
- To learn the methods of organic preparations.

Unit I: Theory of Gravimetry

Principles of quantitative precipitation – Conditions for precipitation – Methods of Digestion – Quantitative filtrations – Techniques of drying - Theory of weighing – Handling of chemical balance – Scientific Reporting.

Unit II: Theory of Organic preparations

Principles of chemical conversions – Handling of organic chemicals and glassware – Filtration techniques – Drying techniques –Distillation techniques - Recrystallization techniques – Scientific Reporting.

Unit III: Gravimetric Analysis

1. Estimation of Lead as Lead chromate
2. Estimation of Barium as Barium chromate
3. Estimation of Nickel as Nickel-DMG complex
4. Estimation of Copper as Copper (I) thiocyanate
5. Estimate of Magnesium as Magnesium oxinate
6. Estimation of Calcium as Calcium oxalate
7. Estimation of Barium as Barium sulfate
8. Estimation of Iron as Iron (III) oxide

Unit IV: Organic Preparation

Preparation of Organic compounds involving the following chemical conversions.

1. Oxidation
2. Reduction
3. Esterification
4. Hydrolysis
5. Nitration
6. Bromination
7. Diazotization
8. Osazone formation
9. Sulphonation

Reference

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & Sons (1997).
2. Furniss, B.S., *et al.*, Vogel's Textbook of Practical Organic Chemistry, (7th edition), London, ELBS – Longman, (1984).

Sem. V & VI
14UCH630217

Hours/Week: 4
Credits: 4

Chemistry Practical-V
ORGANIC ANALYSIS AND PHYSICAL CONSTANTS

Objectives

- To learn the techniques of organic qualitative analysis
- To learn the determination of physical constants of organic compounds.

Unit I: Theory of Organic Analysis

Principles of qualitative analysis – Handling of apparatus and hazardous chemicals like bromine, sodium, NaNO_2 , concentrated acids and bases, etc.
– Theory of the various chemical reactions / tests – Techniques of derivatization - Scientific Reporting.

Unit II: Theory of measurement of physical parameters

Principles of physical measurements – Handling of chemicals and the apparatus – Scientific Reporting.

Unit III: Organic Analysis

Analysis of simple organic compounds:

- a. characterization of functional groups
- b. confirmation by preparation of solid derivatives / characteristic colour reactions

Note:

1. Mono-functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.
2. Each student is expected to do the analysis of at least 15 different organic substances.

Unit IV: Determination of Physical constants

Determination of boiling and melting points by semi micro method.

Reference

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & sons, (1997).
2. Furniss, B.S. *et al.*, Vogel's Textbook of Practical Organic Chemistry, (7th edition), London, ELBS – Longman, (1984).