KANNUR UNIVERSITY
(Abstract)

BSc Chemistry / Polymer Chemistry/Bio Chemistry - Revised Scheme & Syllabi of Core, Complementary and Open Courses under Choice Based Credit Semester System for Under Graduate Programme - implemented with effect from ***2014 admission - Orders Issued.***

ACADEMIC BRANCH

No. Acad/C2/190/2014 **Dated, Civil Station P.O, 28- 05-2014**

Read: 1.U.O No. Acad/C2/2232/2014 dated 14-03-2014
2. Minutes of the meeting of the Board of Studies in Chemistry (UG) held on 01-01-2014.
3. Minutes of the meeting of the Faculty of Science held on 25-03-2014
4. Letter dated 29-03-2014 from the Chairman, BOS in Chemistry (UG).

ORDER

1. The Revised Regulations for UG Programmes under Choice based Credit Semester System were implemented in this University with effect from 2014 admission as per paper read (1) above.

2. As per paper read (2) above the Board of Studies in Chemistry finalized the Scheme , Syllabi & model Question Papers for Core, Complementary & open courses of BSc Chemistry/Polymer Chemistry/Bio Chemistry programmes to be implemented with effect from 2014 admission..

3. As per read (3) above the Faculty of Science held on 25-03-2014 approved Scheme, syllabi & model question papers for core/complementary & open courses of BSc Chemistry/Polymer Chemistry/Bio Chemistry programmes to be implemented with effect from 2014 admission.

4. The Chairman, Board of Studies in Chemistry (UG) vide paper read (4) above has submitted the finalized copy of Scheme, syllabi & Model question papers for core/complementary and open courses of BSc Chemistry/Polymer Chemistry/ Bio Chemistry programmes for implementation with effect from 2014 admission.

5. The Vice Chancellor, after examining the matter in detail, and in exercise of the powers of the Academic Council as per section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with, has accorded sanction to implement the Revised scheme, syllabi& model question papers of BSc Chemistry/Polymer Chemistry/Bio Chemistry Programmes with effect from 2014 admission.

6. Orders, are therefore issued implementing the revised scheme, syllabi & model question papers for core, complementary& open courses of BSc Chemistry/Polymer Chemistry/Bio Chemistry programmes under CBCSS with effect from 2014 admission subject to report to Academic Council

7. Implemented revised Syllabi are appended.

SD/-
DEPUTY REGISTRAR **(ACADEMIC)**

FOR REGISTRAR

Contd.....2

To

1. The Principals of Affiliated Colleges offering B.Sc Chemistry/ Polymer Chemistry/ Bio Chemistry Programmes
2. The Examination Branch (through PA to CE)

Copy To:

1. The Chairman, BOS Chemistry (UG)
2. PS to VC/PA to PVC/PA to Registrar
3. DR/AR I Academic
4. Central Library
5. SF/DF/FC.

Approved/By Order

Section Officer

❖ ***For more details log on to www.kannur university.ac.in***

K A N N U R U N I V E R S I T Y

COURSE STRUCTURE

&

SYLLABUS

FOR

UNDERGRADUATE P ROGRAMME

IN

POLYMER CHEMISTRY

CORE COURSES

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

w.e.f 2014 ADMISSION

Curriculum

Introduction

The B Sc degree programme in Chemistry aims to provide the students with an indepth understanding of Chemical Sciences. The syllabus has been designed to stimulate the interest of the students in Chemistry and to equip them with a potential to contribute to the academic and industrial requirements of the society. The new updated syllabus is based on an interdisciplinary approach and is infused with a new vigour and depth. Chemistry being an experimental science, due importance is given to the development of laboratory and instrumentation skills.

The main objective is to provide to the students a deep understanding of the basic concepts of chemical sciences by acquiring the knowledge of terms, facts, concepts, processes, techniques and principles of the subject. It attempts to equip the students to cater to the industrial needs and to utilise them in the utmost practical manner.

The syllabus has been prepared after discussions with a number of faculty members in the subject and also after evaluating the existing syllabi of BSc, the new syllabi of XI & XII standards, the UGC model curriculum and syllabi of other Universities. The reference materials have been recommended after a thorough study. The revised course pattern, distribution of credits, scheme of evaluation and syllabus approved by the board are given below.

B Sc Polymer Chemistry Programme

The **B Sc Polymer Chemistry** programme is offered in six semesters within a period of three academic years. The programme shall include five types of courses,viz.,

- Common course -English & Additional language (Code A)
- Common (General) course- Polymer Chemistry (CodeA)
- Core course(Code B)
- Complementary course(Code C)
- Open course(Code D)

Credit & Mark distribution of B Sc (Polymer Chemistry) Programme

Total credits for the B Sc Polymer Chemistry programme will be 120 & total marks: 1800 distributed through six semesters with the following details.

Distribution of Marks for BSc Polymer Chemistry Programme

Course	**No.of Papers**	**Marks per paper**	**Total Marks**
Common Course-English	4	50	200
Common Course-Addl.language	2	50	100
Common Course-General Polymer Chemistry	5(4Theory + 1Practical)	40	200
Complementary Course- I	5(4 Theory +1Practical)	40	200
Complementary Course-II Mathematics	4	50	200
Core Course-Chemistry	17(12Theory +5Practicals)	50	850
Project	1	25	25
Open Course	1	25	25

Credit distribution of B Sc Polymer Chemistry Programme

Programme	Sem.	Common*		General	Core	Complementary*		Open	Total
		Eng	Addl		Chemistry	Mathematics	Physics/ Comp.Sc		
BSc(Polymer Chemistry)	I	4+3	4	-	3	3	2		19
	II	4+3	4	-	3	3	2		19
	III	-	-	3+3	3	3	2		14
	IV	-	-	3+3 +4	3+2+2	3	2+4		26
	V	-	-	-	4+4+4+4	-	-	2	18
	VI	-	-	-	4+3+3+3+3+ 3+3+2	-	-	-	24
	Total	14	8	16	56	12	12	2	120

*Detailed distribution of credits will be done by the concerned Board of Studies.

COURSE STRUCTURE FOR UG PROGRAMME
POLYMER CHEMISTRY
2014 ADMISSION

SEMESTER 1

No	Course	Hours/ week	Credit	Marks		
				IA	ESE	Total
1	Common Course 1 – English Course I	5	4	10	40	50
2	Common Course 2 – English Course II	4	3	10	40	50
3	Common Course - Additional Language Course I	5	4	10	40	50
4	Core Course 1	3	3	10	40	50
5	Complementary 1 (Course I)	4	2	8	32	40
6	Complementary 2 (Course I)	4	3	10	40	50
	Total	**25**	**19**	**58**	**232**	**290**

SEMESTER 2

No	Course	Hours/ week	Credit	Marks		
				IA	ESE	Total
1	Common Course 3 – English Course III	5	4	10	40	50
2	Common Course 4 – English Course IV	4	3	10	40	50
3	Common Course - Additional Language CourseII	5	4	10	40	50
4	Core Course 2	3	3	10	40	50
5	Complementary 1 (Course II)	4	2	8	32	40
6	Complementary 2 (Course II)	4	3	10	40	50
	Total	**25**	**19**	**58**	**232**	**290**

SEMESTER 3

No	Course	Hours/ week	Credit	Marks		
				IA	ESE	Total
1	Common Course 11–General Course I Polymer ChemistryI	3	3	8	32	40
2	Common Course 12 – General Course II Polymer Chemistry II Theory,Practicals	5	3	8	32	40
3	Core Course 4	3	3	10	40	50
4	Core Course 3, Practical1, PartI	2	-	-	-	-
5	Core Course 5, Practical2, PartI	2	-	-	-	-
6	Complementary 1 (Course III)	3	2	8	32	40
7	Complementary 1 Practicals	2	-	-	-	-
8	Complementary 2 (Course III)	5	3	10	40	50
	Total	**25**	**14**	**44**	**176**	**220**

SEMESTER 4

No	Course	Hours/ week	Credit	Marks		
				IA	ESE	Total
1	Common Course 13 – General Course III Polymer Chemistry III Theory, Practicals	5	3 + 4	8 + 8	32 + 32	40 + 40
2	Common Course 14 - General Course IV Polymer ChemistryIV	3	3	8	32	40
3	Core Course 6	3	3	10	40	50
4	Core Course 3, Practical 1, PartII	2	2	10	40	50
5	Core Course 5, Practical 2, PartII	2	2	10	40	50
6	Complementary 1 (Course IV)	3	2	8	32	40
7	Complementary 1 Practicals	2	4	8	32	40
8	Complementary 2 (Course III)	5	3	10	40	50
	Total	**25**	**26**	**80**	**320**	**400**

SEMESTER 5

No	Course	Hours/ week	Credit	Marks		
				IA	ESE	Total
1	Open Course 1	2	2	5	20	25
2	Core Course 7	3	4	10	40	50
3	Core Course 8	3	4	10	40	50
4	Core Course 9	3	4	10	40	50
5	Core Course 10	3	4	10	40	50
6	Core Course 11,Practical 3	5	-	-	-	-
7	Core Course 12,Practical 4	5	-	-	-	-
8	Core Course 13,Project&Industrial visit	1	-	-	-	-
	Total	**25**	**18**	**45**	**180**	**225**

SEMESTER 6

No	Course	Hours/ week	Credit	Marks		
				IA	ESE	Total
1	Core Course 14	4	4	10	40	50
2	Core Course 15	4	3	10	40	50
3	Core Course 16	3	3	10	40	50
4	Core Course 17(Elective)	3	3	10	40	50
5	Core Course 18, Practical 5	5	3	10	40	50
6	Core Course 11& 12 Practical 3& 4	5	3 +3	10 10	40 40	50 50
7	Core Course 13 Project & Industrial Visit	**1**	2	4	5 +16	25
	Total	**25**	**24**	**74**	**301**	**375**

Total Credit = 120

Total Marks = 1800

Scheme - Core Course Chemistry

No.	Semester	Course code	Title of the Course	Credits	Contact hr/week	Total Marks
1	I	1B01PCH	Theoretical and Inorganic Chemistry	3	3	50
2	II	2B02PCH	Analytical Chemistry	3	3	50
3	III	3B04CHE	Organic Chemistry-I	3	3	50
4	IV	4B06CHE	Organic Chemistry-II	3	3	50
5	IV	3B03CHE & 4B03CHE	Core Course Practicals 1 Volumetric Analysis	2	2—III Sem 2—IV Sem	50
6	IV	3B05CHE & 4B05CHE	Core Course Practicals 2 Inorganic Qualitative Analysis	2	2—III Sem 2—IV Sem	50
7	V	5B07CHE	Inorganic Chemistry-I	4	3	50
8	V	5B08CHE	Inorganic Chemistry-II	4	3	50
9	V	5B09CHE	Physical Chemistry- I	4	3	50
10	V	5B10CHE	Physical Chemistry- II	4	3	50
11	VI	6B14CHE	Organic Chemistry III	4	4	50
12	VI	6B15CHE	Physical Chemistry III	3	4	50
13	VI	6B16CHE	Physical Methods in Chemistry	3	3	50
14	VI	6B17CHE	Elective **A Environmental Chemistry** **B Applied Chemistry** **C Polymer Chemistry** **D Nano Chemistry**	3	3	50
15	VI	5B11CHE 6B11CHE	Core Course Practicals 3 Gravimetric Analysis	3	5—V Sem 2—VI Sem	50
16	VI	5B12CHE 6B12CHE	Core Course Practicals 4 Organic Chemistry	3	5---V Sem 3---VI Sem	50
17	VI	6B18CHE	Core Course Practicals5 Physical Chemistry	3	5	50
18	VI	5B13CHE 6B13CHE	Project & Industrial Visit	2	1—SemV 1---Sem VI	25

Scheme - - General Course

No	Semester	Course Code	Title of the course	Contact Hr/week	Credits
1	3	3A11PCH	POLYMER CHEMISTRTY I	3	3
2	3	3A12PCH	POLYMER CHEMISTRTY II	3	3
3	3	3A12(A)PCH	POLYMER CHEMISTRTY II (Practical)	2	-
4	4	4A13PCH	POLYMER CHEMISTRTY III	3	3
5	4	4A13(A)PCH	POLYMER CHEMISTRTY III (Practical)	2	4
6	4	4A14PCH	POLYMER CHEMISTRTY IV	3	3

Scheme - Elective Course

No	Semester	Course code	Title of the course	Contact hour/ Week	Credit
1	VI	6B17CHE-A	Environmental Chemistry	3	3
2	VI	6B17CHE-B	Applied Chemistry	3	3
3	VI	6B17CHE-C	Polymer Chemistry	3	3
4	VI	6B17CHE-D	NanoChemistry	3	3

Scheme - Open course

The open course is meant for all the students in the institution except the students of BSc Polymer Chemistry programme. External examination will be conducted at the end of Vth semester.

Options available for Open course (Chemistry)

No	Semester	Course code	Title of the course	Contact hour/ week	Credit
1	V	5D01CHE	Chemistry in Service to man	2	2
2	V	5D02CHE	Drugs-Use & Abuse	2	2
3	V	5D03CHE	Environmental Studies	2	2
4	V	5D04CHE	Nanomaterials	2	2

Scheme --- Complementary Course (Chemistry)

No	Semester	Course code	Title of the course	Contact hour/ week	Credits
1	I	1C01CHE	Chemistry (For Physical & Biological Sciences)	2	2
2	II	2C02CHE	Chemistry (For Physical & Biological Sciences)	2	2
3	III	3C03CHE(BS)	Chemistry (For Biological Science)	3	2
4	III	3C03CHE(PS)	Chemistry (For Physical Science)	3	2
5	IV	4C04CHE(BS)	Chemistry (For Biological Science)	3	2
6	IV	4C04CHE(PS)	Chemistry (For Physical Science)	3	2
5	I,II, III&IV	4C05CHE*	Complementary Chemistry practical	2	4

* External examination will be conducted at the end of IV semester.

Components of Core (Chemistry)

The core courses of BSc Polymer Chemisty programme will consists of the following components.

- Theory
- Practical
- Project (Investigatory)
- Study tour (Visiting Factory/ science institute/laboratory).

Evaluation pattern

Mark system will be followed instead of direct grading for each question. For each course in the semester letter grade, grade point and % of marks are introduced in 7-point indirect grading system as per KUCBCSSUG 2014. Accordingly 20% of the total marks in each course are for internal evaluation and the remaining 80% for external evaluation.

Internal Evaluation (General, Core , Complementary & Open)

Components with percentage of marks of Internal Evaluation of Theory

- Attendance-25%
- Test papers-50%
- Assignment/ Seminar/Viva-25%

Internal evaluation is conducted by the concerned Department in mark system. Marks secured for internal evaluation need be send to University.

External Evaluation (General, Core , Complementary & Open)

External assessment will include Theory, Practical and Project evaluation conducted by University after the completion of a semester. Duration of theory examination for Core & Complementary courses will be 3 hours, where as for Open course is 2 hours. The practical examination for Core & Complementary will be of 4 hour duration.

Project work:

Project work will be carried out in fifth and sixth semesters. Not more than five students can form a group and undertake a project. Each individual student should submit a copy of the project report duly attested by the supervising teacher and Head of the department. The report has to be presented at the time of practical examination conducted at the end of VI semester for evaluation.

Study tour:

Students are required to visit a factory/Laboratory/Research Institute of repute during the course and have to submit the report of the study tour at the end of the sixth semester during the time of practical examination. No credit will be separately given for study tour report.

Practical record, Project report & Study tour report must be certified by the teacher in charge and countersigned by the Head of the Department. Students should submit certified record of respective practical work at the time of University practical examination.

Mark distribution

Table 1: Internal and External marks for Core (Chemistry) courses:

Item	Marks		Total
	Internal	External	
Theory	10	40	50
Practical	10	40	50
Industrial visit	--	5	5
Project	4	16	20

Table 2: Internal and External marks for Complementary/Polymer Chemistry

Item	Marks		Total
	Internal	External	
Theory	8	32	40
Practical	8	32	40

Table 3: Internal and External marks for Open Course (Chemistry)

Item	Marks		Total
	Internal	External	
Theory	5	20	25

Table 4: Distribution of Internal marks for Theory courses (Core,General, Complementary & Open).

Attendance	25%
Assignment /Seminar/Viva	25%
*Test paper	50 %

* At least two test papers are to be conducted and average of these two is to be taken for awarding mark.

Table 5: Distribution of Internal marks for Practical courses

Attendance	25%
Record + Lab involvement*	50%
Test papers	25%

*On completion of each experiment, a report should be presented to the course teacher. It should be recorded in a bound note-book. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, and tables of data collected, equations, calculations, graphs, and other diagrams etc. as necessary and final results.

Table 6: Distribution of internal and external marks for Project

Internal (20% of Total)	%	External (80 % of total)	%
Punctuality	20 %	Relevance of Topic/Statement of Objectives and Methodology	20%
Use of data	20%	Presentation/Quality of analysis and findings	30 %
Scheme and Organization of report	30%	Viva Voce	50%
Viva Voce	30 %		

Criteria for awarding marks for Attendance:

Table 7: Distribution of marks for attendance

.

Attendance %	Marks%
Above 90%	100%
85 to 89%	80%
80 to 84%	60%
76 to 79%	40%
75%	20%

Grading of students

Internal marks alone need to be sent to the University. External examination will be conducted and assessed by the University using mark system. The semester wise performance called SGPA(Semester Grade Point Average) and overall performance on completion of the programme called CGPA (Cumulative Grade Point Average) of a student will be made by the University by taking the marks of internal and external assessments using a 7 Point Indirect Grading System as per KUCBCSSUG 2014. Finally an overall letter grade (called Cumulative Grade) for the entire programme will be awarded by the University. For the detailed calculations of SGPA, CGPA & Overall letter grade readers are directed to refer KUCBCSSUG 2014.

Table 8: Seven Point Indirect Grading System**.**

Marks	Grade	Interpretation	Grade point average	Range of grade	Class
90 and above	A+	Outstanding	6	5.5 - 6	First class with distinction
80 to 89	A	Excellent	5	4.5 - 5.49	
70 to 79	B	Very good	4	3.5 - 4.49	First class
60 to 69	C	Good	3	2.5 - 3.49	
50-59	D	Satisfactory	2	1.5 - 2.49	Second class
40-49	E	Adequate	1	0.5 - 1.49	Pass
Below 40	F	Failure	0	0.0 - 0.49	Fail

Distribution of Marks & type of questions for Core (Chemistry**), Complementary (**Chemistry**) & Open (**Chemistry**) courses**.

Table 9. Type of questions & Marks for External Examination – Core Chemistry

	Total Questions	No. Of Questions to be answered	Marks for each Question	Total Marks
Very short answer	4	4	1	4
Short answer	10	7	2	14
Short essay/Problems	6	4	3	12
Essay	4	2	5	10
	24	17		40

Question papers in Physical Chemistry Course should contain numerical problems for 20% of the total marks.

Table 10.

Type of Questions & Marks for External Examination- Complementary/ PolymerChemistry

	Total Questions	No. Of Questions to be answered	Mark for each Question	Total Marks
Very short answer	5	5	1	5
Short answer	6	4	2	8
Short essay/Problems	5	3	3	9
Essay	4	2	5	10
	20	14		32

Table 11. Type of Questions & Marks for External Examination - Open course Chemistry

	Total Questions	No. Of Questions to be answered	Mark for each Marks for each Question	Total Marks
Very short answer	5	5	1	5
Short answer	5	3	2	6
Short essay/Problems	5	3	3	9
Total	15	11		20

Distribution of marks for the practical examination:

The distribution of marks will be decided by the concerned Board of Examinations.

ANNEXURE I

Guidelines for the Evaluation of Projects

1. PROJECT EVALUATION

1. Evaluation of the Project Report shall be done under Mark System.

2. The evaluation of the project will be done at two stages:
   a) Internal Assessment (supervising teachers will assess the project and award internal Marks)
   b) External evaluation (external examiner appointed by the University)
   c) Marks secured for the project will be awarded to candidates, combining the internal and external Marks

3. The internal to external components is to be taken in the ratio 1:4. Assessment of different components may be taken as below.

Internal(20% of total)	
Components	**% of internal Marks**
Punctuality	20

External(80% of Total)	
Components	**% of external Marks**
Relevance of the Topic, Statement of Objectives, Methodology (Reference/ Bibliography)	20

Use of Data	20	Presentation, Quality of Analysis/Use of Statistical tools, Findings and recommendations	30
Scheme/Organization of Report	30	Viva-Voce	50
Viva-Voce	30		

4. Internal Assessment should be completed 2 weeks before the last working day of VIth semester.

5. Internal Assessment marks should be published in the department.

8. Project evaluation shall be done in the VI semester along with practical exams.

9. Chairman Board of Examinations, may at his discretion, on urgent requirements, make certain exception in the guidelines for the smooth conduct of the evaluation of project.

2. PASS CONDITIONS-

1. Submission of the Project Report and presence of the student for viva are compulsory for internal evaluation. No marks shall be awarded to a candidate if she/he fails to submit the Project Report for external evaluation.

2. The student should get a minimum of 40 % marks for pass in the project.

3. There shall be no improvement chance for the Marks obtained in the Project Report.

4. In an instance of inability of obtaining a minimum of 40% marks, the project work may be re-done and the report may be re-submitted along with subsequent exams through parent department.

SEMESTER - I

1B01PCH : THEORETICAL AND INORGANIC CHEMISTRY

Credit -3

Contact hours-54

UNIT 1. EVALUATION OF ANALYTICAL DATA (13hrs.)

Terms used in evaluation of analytical data – significant figures – Rounding of the numerical expression – Errors – Types of errors- Precision and accuracy –difference between Precision and accuracy – Ways of expressing precisions – Ways to reduce systematic errors - Average deviation from the mean - Standard Deviation – Relative standard deviation – Reporting of analytical data- Statistical treatment of analytical data – Population and samples – Confidence limit-Rejection of a Result Q-test- Test of significance – students t-test, F-test.

UNIT 2. WAVE MECHANICAL CONCEPT OF ATOMIC STRUCTURE (15 hrs.)

Bohr model of hydrogen atom – Bohr's equation for the energy of electron in hydrogen atom – Limitations of Bohr theory- Bohrs Theory and the Origin of Hydrogen spectrum – Classical mechanics – concept, failure. Black body radiation- Planck's law of radiation. Photoelectric effect- Heisensberg's uncertainty principle and its significance, dual nature of electrons – Davisson and Germer's experiment - de Broglie hypothesis - Schrodinger wave equation (derivation not expected), significance of ψ and ψ^2 – Concept of electron charge cloud-Nodal planes in atomic orbitals - Postulates of quantum mechanics, Particle in one-dimensional box – derivation for energy. Quantum numbers - Shapes of orbitals - Aufbau, Pauli's and Hunds rule - Electronic configuration of atoms – The Slaters Rules – The concept of Effective Nuclear Charge.

UNIT 3. CHEMICAL BONDING (13 hrs)

Factors effecting the formation of ionic compound - Lattice energy – Born- Lande equation with derivation - Born Haber cycle and its application - Covalent bond - Polarity of covalent bond-

Covalent Character of ionic bond - Polarisation and Fajan's rule – Dipole Moment and Per cent Ionic Character of a Polar Covalent bond. Valance bond theory and its limitations - Hybridization and shapes of simple molecules (BeF_2, PCl_3, SF_6, CH_4, CH_3-CH_3, CH_2=CH_2, CH≅CH) - VSEPR theory – Shape of molecules and ions (NH_3, XeF_6, ClF_3, NH_4^+, H_3O^+) - Molecular orbital theory - LCAO method - Bond strength and bond energy - Metallic bonding - Free electron and band theory, explanations of metallic properties based on these theories - Weak chemical forces - Hydrogen bond - consequences of Hydrogen bonding - Vander Waal's forces.

UNIT 4. NUCLEAR CHEMISTRY (13 hrs)

Radioactivity - rate of radioactive disintegration - Nature of radiation from radioactive elements – stability of nucleus-binding energy-magic numbers-packing fractions- Mass Defect - n/p ratio. The Nuclear Shell Model – The Liquid Drop Model – Nuclear Fission – Calculation of Energy release in nuclear fission – Nuclear Fusion – Hydrogen bomb.

Detection and measurement of radioactivity - Gieger-Muller counter - Wilson cloud chamber. Radioactive tracers - Rock dating, Carbon dating - Artificial radio activity - Artificial transmutations of elements - cyclotrons - Induced radio activity - Q values of nuclear reactions - Nuclear reactors - Classification of reactors - Breeder reactor - India's nuclear energy programme.

References

1.B.R. Puri, L.R. Sharma, K.C. Kalia., "Principles of Inorganic Chemistry, Milestone publishers;, NewDelhi.

2. Alan G. Sharpe, Inorganic Chemistry, Pearson.

3. D.A. Skoog, D.M. West and S.R. Crouch., "Fundamentals of analytical chemistry, 8th Edn., Books / Cole Nelson.

4. Vogel's Text Book of Quantitative Chemical Analaysis, Pearson Educatiion Ltd.

5. G.D. Christian, Analytical Chemistry, John Wiley and Sons.

6. J. D. Lee., "Concise Inorganic chemistry', Blackwell Science, London.

7. C.N.R. Rao., University General Chemistry, Macmillon, 3rd Edn. John Wiley 2001.

8. D.F. Shriver and P.W. Atkins., Inorganic Chemistry 3rd Edn., Oxford University press.

9. H.J. Arnikar., "Essentials of Nuclear chemistry", New Age International.

10. R. Gopalan., "Elements of Nuclear chemistry", Vikas publication.

SEMSTER II

2B02PCH : Analytical chemistry

Credit -3

Contact Hours-54

Unit 1- Fundamentals of volumetric, gravimetric and qualitative analysis (13 hrs)

Titrimetric analysis – Fundamental concepts – mole, molarity, molality, ppm, and ppb – primary standard – secondary standard, quantitative dilution – problems – acid base titrations – titration curves – pH indicators – redox titrations – titration curves - titrations involving MnO_4^{2-} and $Cr_2O_7^{2-}$, redox indicators – Iodometric titrations – determination of copper and arsenic -– Precipitation titrations – Determination of Chlorides - complexometric titrations - EDTA titrations - titration curves - metal ion indicators. Gravimetric analysis – unit operations in gravimetric analysis. Illustration using iron and barium estimation. Qualitative analysis - theoretical principles of qualitative analysis -solubility products - common ion effect - principles in the separations of cations in qualitative analysis

Unit -2 - Acids, Bases and non aqueous solvents (13 hrs)

Concepts of Lowry and Bronsted – Lux - flood concept – The solvent system concept – The Lewis concept – Relative strength of Acids and Bases – Effect of solvent – Leveling effect – Effect of polarity and substituents – Hard and soft acids and bases – Pearsons concept – Bonding in hard–hard and soft–soft combinations – HSAB principle and its applications – Basis for hard-hard and soft–soft interactions.

Classification of solvents – characteristic properties of a solvent – study of liquid ammonia, liquid HF and H_2SO_4.

Unit - 3 – Separation Methods (13hrs)

Solvent extraction methods – introduction – completeness of extraction – selectivity of extraction – factors favouring solvent extraction – factors affecting extraction – solvent extraction equilibria quantitative treatment – experimental methods- analytical applications.

Chromatographic methods – Adsorption and Partition Chromatography – Principle, experimental procedure and applications of Liquid-Liquid chromatography, Thin layer chromatography, gas chromatography and ion exchange chromatography.

Exclusion (Gel) Chromatography - Gel permeation chromatography – brief introduction, advantages and application of GPC.

Unit – 4- Instrumental methods in chemical analysis (15hrs)

Thermogravimetric analysis – introduction – instrumentation – factors affecting TGA – application of TGA. Differential thermal analysis – introduction – instrumentation – principle of working – factors affecting DTA – application. Thermometric titrations – a brief study.

Atomic Absorption Spectroscopy and Flame Emission Spectroscopy – Theory, Instrumentation and applications.

Radio chemical methods of analysis – introduction – activation analysis – a brief study.Neutron diffraction – theoretical aspects – thermal neutron – instrumentation – application.

References

1. B R Puri, L R Sharma, K C Kalia, Principles of Inorganic Chemistry, Milestone publishers, New Delhi.
2. D A Skoog, D M West and S R Crouch, Fundamentals of Analytical Chemistry, 8th Edition, Brooks/Cole Nelson (Chapter 12-17).
3. Vogel's Text Book of Quantitative Chemical Analysis, 6th Edition, Peasons education limited,
4. Vogel's Text Book of Qualitative Analysis
5. G D Christian, Analytical Chemistry, John Wiley and Sons..
6. J.D Lee, Concise inorganic chemistry, Blackwell Science, London
7. Jain & Jain, Engineering Chemistry, Dhanpat Rai Publishing Company.
8. Chatwal and Anand, Instrumental methods of chemical analysis.
9. A K Srivastava, P C Jain Instrumental approach to chemical analysis. S Chand.
10. H. Kaur, Instrumental methods of chemical analysis, Pragati Prakashan, Meerut.

SEMESTER III

3B04CHE : ORGANIC CHEMISTRY I

Credit-3
Contact Hours-54

UNIT 1 INTRODUCTION TO ORGANIC CHEMISTRY (6 HOURS)

Uniqueness of carbon-Classification of Organic compounds-Homologous series-Functional groups- IUPAC nomenclature of Organic compounds- Alkanes, , Alkenes, Alkynes, Cycloalkanes (bicycloalkanes), Mono and bifunctional compounds - Halogens, Nitro, Alcohols, Ethers, Nitriles, Amines,Aldehydes, Ketones, Carboxylic acids and their derivatives. Hybridisation in carbon atom - sp^3, sp^2 and sp hybridization with examples.

UNIT 2 INTRODUCTION TO REACTION MECHANISM (10 HOURS)

Representation of structural formulae –Bonding notations - Drawing electron movements with arrows- curved arrow notation- Half headed and double headed arrows.

Electronegativity- Polarity in bonds- Electron displacement in organic molecules- Inductive effect- Electromeric effect- Mesomeric effect/ Resonance- Hyperconjugation- Their illustrations - Homolytic and Heterolytic bond fission – Reaction intermediates- Carbocations, Carbanions, Free radicals, Carbenes and Nitrenes - Their generation , Structure and stability. Types of reagents – Electrophiles and Nucleophiles.

UNIT 3 MECHANISM OF ORGANIC REACTIONS (10 HOURS)

Substrate and reagent- Aliphatic nucleophilic substitutions-mechanism of S_N1,S_N2-Effect of structure on S_N1 and S_N2 as illustrated by Primary, Secondary and Tertiary alkyl halides - Stereo Chemistry of S_N1 and S_N2 reaction – Walden Inversion-Mechanism of Electrophilic addition of Hydrogen halides to Carbon – Carbon double bond- Markownikoff's rule – Kharasch effect (Free radical addition of HBr on unsymmetrical double bond)- Elimination – E1 and E2 mechanism – mechanism of dehydration of alcohol and dehydrohalogenation of alkyl halides – Saytzeff rule and Hofmann's rule.

UNIT 4 HYDROCARBONS (15 HOURS)

Alkanes – Preparation by Reduction of alkyl halides and Wurtz reaction mechanism of Kolbe's electrolytic method.

Alkenes – Preparation by dehydration of alcohols, dehydrohalogenation of alkylhalides, dehalogenation of vic dihalides and by Kolbe's electrolytic method. Reactions – Hydrogenation,

addition of halogens, halogen acid and water. Oxidation with $KMnO_4$, $K_2Cr_2O_7$ and Osmium tetroxide, Ozonolysis and polymerization.

Alkynes – Preparation by dehydrohalogenation of vic dihalides and gem dihalides, dehalogenation of tetrahalides and Kolbe's electrolytic method. Reactions, addition of Hydrogen, Halogen, Halogen acid and water – oxidation using alkaline $KMnO_4$, Acidic $K_2Cr_2O_7$ and Selenium dioxide. Ozonolysis and Polymerization reactions specific to 1-alkyne.

Dienes – Conjugated, cumulated and isolated dienes with example, preparation of 1, 3 butadiene-by dehydration of diols. Reactions of 1, 3 butadiene – 1,2 and 1,4 additions, polymerization.

Polynuclear Hydrocarbons- Haworth Synthesis of naphthalene, synthesis of Anthracene from benzyl chloride.

Cycloalkane – Preparation by Freunds and Wislicenus methods.

UNIT 5 HALOGEN COMPOUNDS (5 HOURS)

Alkyl halides – preparation from alcohol – Reaction of alkyl halides with metal.

Dihalides – Gem dihalides and Vic dihalides – General methods of preparation – General reaction.

Trihalogen derivative of methane – Chloroform – preparation from ethanol and acetone – Haloform reaction.

UNIT 6 HYDROXY COMPOUNDS (8 HOURS)

Alcohols – Preparation of monohydric alcohols from carbonyl compounds using Grignard reagents – Methods to distinguish 1^o, 2^o and 3^o alcohols – Lucas method, Victor Meyer's method and oxidation method – Ascent and descent in alcohol series.

Glycerol – Manufacture from fats and oils – Synthesis from propylene –Properties and uses.

Phenols – Acidic character of phenol – Preparation of phenol from cumene –Preparation of cresols, nitrophenols, picric acid, dihydric phenols and naphthols.Phenolic ethers – Preparation of anisole and phenetole.Mechanism of Pinacol - Pinacolone, Fries and Claisen rearrangements.

References

1. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', Visal Publishing Company Co.
2. K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', Vikas Publishing House
3. B. S. Bahl 'Advanced organic Chemistry', S. Chand.
4. Peter Sykes, 'A Guide book to Mechanism in Organic Chemistry' , Pearson Education.
5. P. S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age InternationalPublishers.
5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', Prentice Hall of India
6. I. L. Finar, 'Organic Chemistry', Vol.- I, Pearson Education

Further Reading

1. P. Y. Bruice, 'Organic Chemistry', Pearson Education.
2. J. March, 'Advanced Organic Chemistry', John Wiley & Sons, NY
3. S. H. Pine 'Organic Chemistry', McGraw Hill
4. J. Clayden, N. Greeves, S. Warren and P. Wothers, 'Organic Chemistry', Oxford University Press

SEMESTER IV

4B06CHE- ORGANIC CHEMISTRY II

Credit-3
Contact Hours-54

UNIT 1 AROMATICITY (12 HOURS)

Structure of Benzene – Aromaticity and antiaromaticity - Molecular Orbital Theory of aromaticity- Huckel's rule- Six electron systems- Mention of structures of some non benzenoid aromatic compounds-cyclopropenyl cation-cyclopentadienyl anion- ferrocene-tropylium cation-azulene.

Mechanism of aromatic electrophilic substitution-Halogenation, Nitration and Sulphonation - Friedel –Craft's alkylation and acylation—Orientation and reactivity in monosubstituted benzene rings- Ortho/para ratio-Aromatic nucleophilic substitution- SNAr mechanism and Benzyne mechanism

UNIT 2 STEREOCHEMISTRY (16 HOURS)

Stereoisomerism - definition - classification into optical and geometrical isomerism - Projection formulae - Fischer, wedge, sawhorse and Newman projection formulae - notation of optical isomers -D-L notation- Cahn-Ingold-Prelog rules - R-S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations.

Optical isomerism - optical activity - optical and specific rotations - conditions for optical activity - asymmetric centre - chirality - achiral molecules - meaning of (+) and (-) -Elements of symmetry -Racemisation - Resolution - methods of resolution- Optical activity in compounds not containing asymmetric carbon atoms- Biphenyls.

Geometrical isomerism - cis-trans, syn-anti and E-Z notations - geometrical isomerism in maleic and fumaric acids.

Conformational analysis - introduction of terms - conformers, dihedral angle, torsional strain - Conformational analysis of ethane and n-butane including energy diagrams - conformers of cyclohexane (chair, boat, half chair and twist boat forms) - axial and equatorial bonds-ring flipping showing axial equatorial interconversions- conformation of methyl cyclohexane.

UNIT 3 CARBOHYDRATES (12 HOURS)

Definition- Classification and nomenclature of carbohydrates.

Monosaccharides-Configuration of Aldotrioses, Tetroses, Pentoses and Hexoses-Structure and configuration of glucose and fructose- Cyclic structure- Haworth projection formula-reactions of glucose and fructose- Mutarotations- ascent and descent in aldoses-Interconversion of aldoses and ketoses- Anomers, Epimers and Epimerisation-Conversion of an aldose into its epimer.

Disaccharides- Configurational open chain and ring structure of sucrose, maltose and lactose (structural elucidation not expected)

Poly saccharides- Elementary study of starch and cellulose – structural difference between starch and cellulose- Industrial uses of cellulose.

UNIT 4 HETEROCYCLIC COMPOUNDS (8 HOURS)

Nomenclature of 5 and 6 membered heterocyclic compounds-Peparation, properties and structure of the following compounds- Pyrrole,Furan, Thiophene, Pyridine, Indole, Quinoline, Isoquinoline and pyrimidine- Relative basic character of Pyrrole, pyridine and piperidine-Hofmann's exhaustive methylation of piperidine.

UNIT 5 POLYMER CHEMISTRY (6 HOURS)

Classification – Natural and synthetic polymers – Thermoplastics and thermosetting plastics – Elastomers – Fibres – Liquid resins – Types of polymerization –Chain and step polymerization – Homopolymers and Co-polymers – Synthesis and application of Polyethylene, Polypropylene, PVC, Polystyrene, Polyurethanes, Phenolic and Epoxy resins – Synthetic rubber – Buna-S, Buna-Neoprene, and Butyl rubber-Biodegradability.

References

1. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry' 3rd Edition, Visal Publishing Company Co.
2. K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House
3. B. S. Bahl 'Advanced organic Chemistry', S. Chand.
4. P. S. Kalsi' 'Stereochemistry, Conformation and Mechanisms'' New Age International Publishers
5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India
6. I. L. Finar 'Organic Chemistry', Vol.- 1, Pearson Education
7. I. L. Finar 'Organic Chemistry', Vol.- 2, Pearson Education
8. Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar,' Polymer Science', Wiley

Eastern Ltd., New Delhi.

Further Reading

1. P. Y. Bruice, 'Organic Chemistry', Pearson Education.
2. J. March, 'Advanced Organic Chemistry', John Wiley & Sons, NY
3. S. H. Pine 'Organic Chemistry', McGraw Hill
4. J. Clayden, N. Greeves, S. Warren and P. Wothers, 'Organic Chemistry', Oxford University Press
5. D. Nasipuri 'Stereochemistry of Organic Compounds', New Age International Publishers
6. Billmeyer F.W., 'Text book of polymer science', Jr.John Wiley and Sons, 1994.

SEMESTER V

5B07CHE-INORGANIC CHEMISTRY-I

Credit 4

Contact Hours-54

UNIT1.GENERAL PROPERTIES OF ELEMENTS (9hrs)

Covalent and ionic radii--Trends in the periodic table. Periodic properties-- Ionisation energy. Electron affinity and Electronegativity (Pauling and Mulliken's, approach). Metallic character.Variable valency and Oxidation states.

General properties of transition elements – Electronic configurations,Oxidation states, colour, magnetic properties, tendency to form complexes and catalytic properties.

Comparison of first transition series with second and third series.

UNIT 2.CHEMISTRY OF S BLOCK ELEMENTS(9hrs)

Hydrogen : Isotopes (separation method not needed) Ortho and para hydrogen Hydrides and their classification.

Alkali and alkaline earth metals: Occurrence and extraction (principle only). Periodic properties of hydrides, oxides, halides,hydroxides and carbonates. Flame colours and spectra. Metal solutions in liquid ammonia –characteristic properties and uses. Diagonal relationship. Macro cycles- Crowns and crypts.

UNIT 3.CHEMISTRY OF P BLOCK ELEMENTS (9hrs)

Comparative study based on electronic configuration and periodic properties of Hydrides,Oxides,Halides,Carbides and Oxoacids. Inert pair effect.

Metallic and non-metallic character. Acid-base properties of oxides. Hydrolysis of halides. Exceptional behavior of second period element in the following groups of elements-Group13(B,Al,Ga,In andTl).Group14(C,Si,Ge,Sn and Pb) Group15(N,P,As,Sb and Bi).Group16(O,S,Se,Te and Po)and Group17(F,Cl,Br and I).

UNIT 4. NOBLE GASES (9hrs)

History of discovery of noble gases. Electronic configuration and position in the periodic table. General physical properties, uses of noble gases. Compounds of noble gases– Clathrates, compounds of Xenon—XeF_2, XeF_4, XeF_6, XeO_2F_2 , $XeOF_2$, $XeOF_4$ and XeO_3. Preparation, hybridization and geometry of these compounds.Fluorides of Krypton and Radon.

UNIT 5. PREPARATION,PROPERTIES,STRUCTURE AND USES OF SOME INORGANIC COMPOUNDS (9hrs)

Hydrides of boron – B_2H_6 and B_4H_{10}. Borazine, Boric acid, oxoacids of halogens, Inter halogen compounds, Pseudo halogens, Fluorocarbons.

Inorganic polymers

Phosphorous based, sulphur based and silicon based(silicones and silicates) polymers.

Refractories

Introduction- classification- super refractories - silicon carbide. Pure oxide refractories.

UNIT 6. ORGANOMETALLIC COMPOUNDS (9hrs)

Introduction. Classification based on the nature of metal-carbon bond.

preparation,properties, structure (valence bond theory) and uses of mononuclear(Ni,Fe), binuclear (Fe,Mn,Co) and trinuclear (Fe) metal carbonyls-Application of 18 electron rule to predict M-M bond.Preparation,properties , structure and bonding of Ferrocene.

References

1. F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 5th edn., John Wiley, New York.
2. 2. J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London.
3. D. F. Shriver and P.W. Atkins, Inorganic Chemistry 3rd edn., Oxford University Press.
4. R. C. Mehrothra and A. Singh, Organometallic chemistry, New age publishers.
5. J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson.
6. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi.
7. Emelus and Anderson, Principles of Inorganic Chemistry.
8. Dr. S.K.Agarwala and Dr. Keemtilal, Advanced Inorganic Chemistry.
9. Jain and Jain, Engineering Chemistry.,Dhanpat Rai Publishing Company.

SEMESTER V

5B08CHE-INORGANIC CHEMISTRY –II

Credit-4

Contact hours:54

UNIT 1. COORDINATION CHEMISTRY- I (9hrs)

Introduction-Double salts and Coordination compounds. Nomenclature. Effective Atomic Number (EAN). Shapes of d orbitals.-Types of ligands. Chelates. Stereo chemistry of coordination compounds with coordination numbers 2 to 6. Isomerism. Stability of complex ions-stability constant. Factors affecting the stabilityof complexes. Application of complex formation in qualitative and quantitative analysis.

UNIT 2. COORDINATION CHEMISTRY- II (9hrs)

Theories of bonding in transition metal complexes– Valence bond theory . Application to some complexes-Hybridization in tetrahedral, square planar and octahedral complexes – explanation of magnetic properties based on VBT. Limitations of VBT. Crystal field theory- Crystal field splitting in octahedral, tetrahedral and square planar geometries. Factors affecting the magnitude of crystal field splitting. Crystal field stabilization energy(CFSE). Explanation of colour, spectral and magnetic properties .Spectrochemical series.

UNIT 3. BIOINORGANIC CHEMISTRY(9hrs)

Myoglobin and Haemoglobin – Structure and functions of haemoglobin and myoglobin. Cooperativity effect.Explanation of cooperativity effect in haemoglobin.Metallo enzymes of iron and zinc (structural details not needed).Role of metal ions in biological systems. Metal ion transport across cell membrane – sodium/potassium pump. Biochemistry of Mg and CaBiological functions and toxicity of some elements – Cr, Mn,Co,Ni,Cu,As,Cd,Pb,Hg, I, Fe, and Zn.Biological fixation of nitrogen.

UNIT 4. INNER TRANSITION ELEMENTS.(9hrs).

Lanthanides – Occurrence and separation by ion – exchange chromatography.Electronic configurations,oxidation states,magnetic properties and spectra of lanthanides. Lanthanide contraction—causes and consequences.

Actinides : Electronic configurations, oxidation states, spectra and magnetic properties.Trans actinide elements – Preparation, IUPAC nomenclature.

Comparison of transition and inner transition elements

UNIT 5.METALS AND ALLOYS (9hrs)

Occurrence of metals.Various steps involved in metallurgical processes.

Electrometallurgy, Hydrometallurgy.

Coinage metals-Occurrence and extraction of copper, silver and gold.

Powder metallurgy(brief discussion).Alloy steels-application of alloy steels.Heat treatment of steel.Nonferrous alloys and their uses.

UNIT 6.CORROSION AND CORROSION CONTROL(9hrs) Introduction.

Types of corrosion. Causes of corrosion.Theories of corrosion- Direct chemical

attack or dry corrosion.Electrochemical theory or wet corrosion. Differential

Aeration or concentration cell corrosion.

Factors influencing corrosion- nature of the metal- nature of the environment.

Corrosion control.

References

1.F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry ., John Wiley, New

York.

2. J. D. Lee, Concise Inorganic Chemistry ., Blackwell Science, London.

3. D. F. Shriver and P.W. Atkins, Inorganic Chemistry ., Oxford University Press.

4. J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson.

9. A G Sharpe, Inorganic Chemistry, 3rd Edn. Pearson

6 Principles of Inorganic Chemistry – Emelus and Anderson

7. Advanced Inorganic Chemistry –Dr. S.K.Agarwala and Dr.Keemtilal

8.Industrial chemistry—B.K.Sharma

9.Engineering chemisty.2nd Edn.-N.Krishnamoorthi, P.Vallinayagam,D.Madhavan

SEMESTER V

5B09CHE PHYSICAL CHEMISTRY – 1

Credit 4
Contact hrs 54

UNIT 1 The Properties of Gases (15 hrs)

Gas laws – The general gas equation– The Kinetic model of gases – gas laws from the kinetic theory of gases ---Molecular Speeds – Maxwell's distribution of molecular speeds – Most probable velocity, average velocity and root mean square velocity — Collision diameter – Mean free path, Collision number and collision frequency – Degrees of freedom of a gaseous molecule – Principle of equipartition of energy and contribution towards heat capacity of an ideal gas.
Real gases – Molecular attractions – The compressibility factor – virial equation of state – Van der waals equation expressed in virial form – calculation of Boyle's temperature – Isotherm of real gases and their comparison with Van der waals isotherms – continuity of states – critical phenomenon – critical constants of a gas and its determination – Determination of molecular mass by limiting density method – Principle of corresponding states – Liquefaction of gases by Joule Thomson effect.

UNIT 2 Liquid State (7hrs)

Properties of liquids– Surface tension and its determination – Interfacial tension – surface active agents –effect of temperature on surface tension- Parachor and its applications – Viscosity - determination of coefficient of viscosity and its variation with temperature – refractive index – specific and molar refraction – Measurement of refractive index – Abbe's refractometer – optical activity and its measurement using Polarimeter.

UNIT 3 Solid State (16 hrs)

Amorphous and crystalline solids – Laws of crystallography – Law of constancy of interfacial angles – Law of constancy of symmetry – Law of rationality of indices – space lattice and unit cell – Miller indices –seven crystallographic systems – Bravais lattices – Spacing of lattice planes in simple cubic, body centred and face centred cubic systems – Number of particles per unit cell in each of these - Calculation of Avogadro number, density and molecular mass from crystallographic data. Determination of internal structure of crystals by X-ray diffraction methods – derivation of Bragg's equation – Bragg's rotating crystal method and De bye Scherrer Powder diffraction method – Crystal structure of NaCl – anomalous nature of diffraction pattern of KCl.
Co-ordination Number – Efficiency of packing – Cubic and Hexagonal packing – Radius ratio rule – Tetrahedral and Octahedral voids.

Liquid crystals – types – Examples – applications

Classification based on cohesive forces in crystals-ionic, covalent, molecular and metallic crystals - Properties of solids – Electrical conductivity – Conductor, semiconductors– extrinsic, intrinsic-n-type and p-type – Hall effect – super conductors – magnetic properties of solids.

UNIT 4 Solutions (16 hrs)

Types of solutions and methods for expressing concentration — Gas Liquid system — Henry's Law – Liquid systems — Completely miscible- Ideal and non- ideal solutions –Raoult's Law – Vapour pressure – composition diagrams-Azeotropic mixtures– Temperature – composition curves – Partially miscible liquids –Upper and Lower Critical solution temperature –Immiscible liquids – Steam distillation – Molar mass from steam distillation –

Dilute Solutions

Colligative properties – Lowering of vapour pressure and Raoult's law – Calculation of molar mass. Elevation of boiling point – relation to lowering of vapour pressure – Thermodynamic derivation – Calculation of molar mass –Depression of freezing point – Thermodynamic derivation – Calculation of molar mass – Measurement by Beckmann's method – Osmotic pressure – Measurement by Berkely and Hartley's method – Laws of Osmotic pressure – Van't Hoff equation – Calculation of molar mass – Abnormal molar mass – Van't Hoff factor – Degree of dissociation and association and their calculation from colligative properties

References

1. Physical Chemistry : P.W. Atkins, Oxford University Press
2. Physical Chemistry : Puri, Sharma and Pathania, Vishal Publishing Co.
3. A Text book of Physical Chemistry: A S Negi and S C Anand, New Age International Publishers.
4. A Textbook of Physical chemistry: K. L. Kapoor, Volume 1, Macmillan India Ltd
5. Text book of Physical Chemistry : Samuel Glasstone, McMillan Press Ltd.
6. Advanced Physical Chemistry: Gurdeep Raj, Goel Publishing House, Meerut.
7. Physical Chemistry: W.J. Moore, Orient Longmans.
8. Physical Chemistry: N. Kundu & S.K. Jain, S.Chand & Company.
9. Introduction to solids Leonid V Azaroff

SEMESTER V
5B10CHE PHYSICAL CHEMISTRY – 1I

Credit 4
Contact hrs 54

UNIT 1Thermodynamics I (15 hrs)

The first Law – the basic concepts – System – surrounding– open, closed and isolated system — intensive and extensive properties -Isothermal, Isochoric and Isobaric process – work – Heat – Energy — state and path functions – exact and inexact differentials– The statement of first law – – the conservation of energy– Internal energy – Expansion work – general expression of work – free expansion – Expansion against constant pressure – reversible expansion– Heat capacity at constant volume (Cv) and at constant pressure (Cp) – relation between Cp and Cv – Thermodynamic derivation– Adiabatic change –Relation between P,V &T in reversible adiabatic change - work of adiabatic change. The internal pressure –Changes in enthalpy at constant volume – isothermal compressibility – Joule – Thomson effect – inversion temperature -Zeroth Law of Thermodynamics.

Thermo chemistry – Standard enthalpy changes – Enthalpies of physical change – Enthalpy of vapourisation, enthalpy of transition and enthalpy of fusion – enthalpy chemical changes – Thermo chemical equation – Standard enthalpy of reaction, combustion and formation – Change in internal energy(ΔU) and enthalpy (ΔH) of chemical reactions, relation between ΔU and ΔH, variation of enthalpy of reaction with temperature-Kirchhoff's equation.

UNIT 2 Thermodynamics II (12 hrs)

The Second Law – the concepts – Spontaneous and non-spontaneous process – statement of second law – Entropy –Entropy as a state function – – Carnot cycle – efficiency of a heat engine– Entropy changes in isothermal expansion of an ideal gas –Calculation of entropy change of an ideal gas with change in P, V and T –Entropy changes accompanying phase transitions Helmholtz and Gibbs free energies – their significance – Maxwell's relations – Criteria of spontaneity – Gibbs–Helmholtz equation – Partial molar free energy – Concept of chemical potential – Gibbs - Duhem equation– Clausius – Clapyeyron equation applicable to solid – liquid, solid-vapour and liquid-vapour equilibria.

Third Law of thermodynamics – The Nernst heat theorem – Absolute entropy – Calculation of absolute entropies of solids, liquids and gases

UNIT 3 Chemical Equilibrium(8 hrs)

Law of mass action-equilibrium constant – Relation between Kp, Kc and Kx – Thermodynamic treatment of the law of mass action – Vant Hoff reaction isotherm – Temperature dependence of the equilibrium constant – The Van't Hoffs isochore– Pressure dependence of the equilibrium constant Kp– Study of heterogeneous equilibria – Factors that change the state of equilibrium – Le –chatelier's principle and its application to chemical and physical equilibria. Mention

homogeneous gaseous equilibria having zero,positive and negative values of Δn. Calculation of degree of dissociation and Kp. Heterogeneous equilibria –Dissociation of solid calcium carbonate and decomposition of solid NH_4HS.

UNIT 4 Phase Rule (10 hrs)

Statement – Explanation of terms involved – Thermodynamic derivation of phase rule – Application to water system and sulphur system – Solid – liquid equilibria involving simple eutectic system – Ag-Pb system – De silverisation of lead – Freezing mixtures – Solid – liquid equilibria involving compound formation with congruent and incongruent melting points– $FeCl_3$–H_2O system and Na_2SO_4 water system – Solid – gas system – Dehydration of $CuSO_4$.5 H_2O-Deliquescence and efflorescence (mention only). Nernst distribution Law – Thermodynamic derivation– Limitations of the law – Application of the law to study association and dissociation – Solvent extraction – Hydrolysis of salts – The equilibrium of KI + I2 → KI3 .

UNIT4 Colloids, Surface Chemistry (9 hrs)

Colloids, Classification – preparation – structure and stability – The electrical double layer – Zeta potential (no derivation)– Properties of Colloids – Tyndall effect – Brownian movement – Coagulation of colloidal solution – Hardy – Schulze rule – Flocculation value – Electro kinetic properties – Electrophoresis – Electro-osmosis – Protective colloids – Gold number – Emulsion – Oil in water emulsion and water in oil emulsion – Emulsifying agents – Gels –Micelles.
Physical and chemical adsorption – Adsorption isotherms – – Freundlich adsorption isotherm – effect of temperature on adsorption – Langmuir adsorption isotherm – derivation – use and limitation.B.E.T. equations (B.E.T. no derivation) – Gibbs adsorption equation(no derivation) —– Surface films - Determination of surface area using Langmuir equations.

References

1. Physical Chemistry : P.W. Atkins, Oxford University Press
2. Physical Chemistry : Puri, Sharma and Pathania, Vishal Publishing Co.
3. A Text book of Physical Chemistry: A S Negi and S C Anand, New Age International Publishers.
4. A Textbook of Physical chemistry: K. L. Kapoor, Volumes 2 &3, Macmillan India Ltd.
5. Text book of Physical Chemistry : Samuel Glasstone, McMillan Press
6. Advanced Physical Chemistry: Gurdeep Raj, Goel Publishing House, Meerut.
7. Physical Chemistry: W.J. Moore, Orient Longmans.
8. Physical Chemistry: N. Kundu & S.K. Jain, S.Chand & Company.
9. Chemical Thermodynamics: J.Rajaram and J.C.kuriacose,Pearson.

SEMESTER VI
6B14CHE ORGANIC CHEMISTRY III

Credit 4
Contact Hours-72

UNIT 1 - CARBONYL COMPOUNDS (12 HOURS)

Preparation of aldehydes and ketones – Rosenmund's reduction, Stephen's reduction, Etard's reaction, Oppeanauer oxidation, Houben – Hoesh synthesis. Reactions of aldehydes and ketones. Reduction using $LiA1H_4$ and $NaBH_4$ MPV, Clemensen and Wolf-Kishner reduction. Reduction to pinacols – Oxidation using mild and strong oxidizing agents – SeO_2 oxidation – Reaction with alcohols, KCN, sodium bisulphite and derivatives of ammonia – Distinction between acetaldehyde and benzaldehyde and acetaldehyde and acetone.

Mechanism of the following reactions – Aldol condensation , Cannizzaro's reaction, Crossed Cannizzaro's reaction, Reimer – Tiemann reaction, Perkin's reaction, Benzoin condensation and Beckmann rearrangement. Reaction of formaldehyde with aldehydes containing alpha hydrogen atoms.
Preparation of acrolein, crotonaldehyde and vanillin.
Quinones – Preparation and important reactions of p-benzoquinone, 1, 4 –Naphthaquinone and 9, 10 – Anthraquinone.

UNIT 2 -CARBOXYLIC ACIDS (8 HOURS)

Carboxylic acids – Ascent and descent in aliphatic acid series, Preparation and reactions of acrylic and crotonic acids.

Hydroxy acids – Effect of heat on alpha, beta, gamma and delta hydroxyl acids – Preparation and reactions of lactic acid, tartaric acid and citric acid.

Dicarboxylic acids – Preparation and reactions of oxalic, malonic, succinic, maleic and fumaric acids – Blanc's rule.

Aromatic acids – Preparation and reactions of Benzoic acid, anthranilic acid, salicylic acid, cinnamic acid and phthalic acid.

UNIT 3- NITROGEN COMPOUNDS (14 HOURS)

Cyanides and Isocyanides – Distinction between cyanides and isocyanides.

Nitroalkanes – General methods of preparation and reactions of primary, secondary and tertiary nitroalkanes. Distinction between primary, secondary and tertiary nitroalkanes.

Aromatic nitrocompounds – Reduction of nitrobenzene under different conditions – Preparation of dinitrobenzene, 1, 3, 5 – trinitrobenzene, nitrotoluenes and 2, 4, 6 – trinitrotoluene –Mechanism of Benzidine rearrangement.

Amines – Separation of primary, secondary and tertiary amines – Hinsberg and Hoffmann method to distinguish primary, secondary and tertiary amines. Preparation of quaternary ammonium salts.

Aromatic amines – Preparation and reactions of aniline, toluidines, phenylene diamines, diphenyl amine, N-Methyl aniline, N, N-dimethyl aniline and naphthyl amines. Distinction between benzyl amine and toluidine.

Diazonium salts – Preparation, synthetic applications and structure of benzene diazonium chloride, Diazomethane and diazoacetic ester-Ardnt-Eistert synthesis – Wolf rearrangement – mechanism.

Preparation, Properties and structure of urea- Preparation and reactions of semicarbazide and thiourea – Preparation of Urethane.

UNIT 4 PHOTOCHEMISTRY AND PERICYCLIC REACTIONS (7 HOURS)

Introduction to photochemistry- Photochemical reactions of carbonyl compounds (Acyclic only)- Norrish type I and II cleavages

Types of pericyclic reactions-Woodward –Hoffman rule- Electrocyclic reactions-Analysis of electrocyclic reactions (Butadiene to Cyclobetene only)- Cycloadditions-Examples-Diels Alder reaction- Analysis of [2+2] cycloaddition by FMO method.

UNIT 5 SYNTHETIC REAGENTS (6 HOURS)

Active methylene group- Preparation and synthetic application of Ethyl acetoacetate, Diethyl malonate and Ethyl cyano acetate- Mechanism of Claisen condensation- Preparation and synthetic applications of Grignard reagents and Frankland reagent-mechanism of Reformatsky reaction.

UNIT 6 BIOORGANIC CHEMISTRY AND NATURAL PRODUCTS (13 HOURS)

Amino acids- Classification- Structure of Glycine, Alanine, Phenyl amine, Tryptophan and Glutamic acid (Structure elucidation not expected) Synthesis of amino acids- Gabriel, Strecker and Erlemeyer synthesis- Zwitter ion property- Isoelectric point- Sorenson formal titration- Peptides and poly peptides- C-terminal and N-terminal analysis.

Proteins- Functions of proteins- Primary , secondary and tertiary structure of proteins-

Nucleic acids- Introduction- Nucleosides and Nucleotides- Structure (elucidation not expected) of DNA and RNA- Self replication- Protein synthesis- Lipids- Biological function of different types of lipids

Terpenes- Definition- Isoprene rule- Occurrence, isolation and structural elucidation of Citral - natural rubber.

Alkaloids- Introduction- Properties and structure of Coniine, Nicotine and Quinine- Structural elucidation of Coniine only.

Steroids- General characteristics, structure of cholesterol, Testosterone and Oestrone.

UNIT 7 DYES AND DRUGS (7 HOURS)

Dyes- classification of dyes based on structure and application- Structures of Malachite green- Methyl orange- Eosin- Indigo- Crystal violet- Fluorescein and Alizarine (structure elucidation not expected)

Chemotherapeutic agents- classification, Drug action- Antibiotics- Discovery, importance, mode of action and examples- Misuse of antibiotics- Sulpha drugs-mode of action- Importance- Examples and uses. Antipyretics & analgesic- examples-uses. Anesthetic, Antiseptic, Antihistamines and tranquillizers, narcotics- their actions and examples. Misuse of drugs.

UNIT 8 GREEN CHEMISTRY (5 HOURS)

Need for Green chemistry – Goals of green chemistry – Limitations.

Twelve principles of green chemistry with their explanations and examples – Designing a green synthesis – Prevention of waste / byproducts – Atom economy (maximum incorporation of materials used in the process) – Minimization of hazardous / toxic products.

Green synthesis – Microwave assisted reactions in water – Hoffann Elimination – Microwave assisted reaction in organic solvent – Diels Alder reaction, Ultrasound assisted reaction – Esterification, Saponification.Green chemistry in day to day life.

References

1. M. K. Jain and S. C. Sharma ‘Modern Organic Chemistry’, Visal Publishing Company Co.
2. K. S. Tewari and N. K. Vishnoi ‘Organic Chemistry’, Vikas Publishing House
3. B. S. Bahl ‘Advanced organic Chemistry’, S. Chand.
4. Peter Sykes, A Guide book to Mechanism in Organic Chemistry , Pearson Education.
5. P. S. Kalsi’ ‘Organic Reactions and their Mechanisms’’ New Age International Publishers.
5. R. T. Morrison and R. N. Boyd, ‘Organic Chemistry’, Pearson Education.

6. I. L. Finar Organic Chemistry, Vol.- II, Pearson Education
7. M.S.Yadav, ‘Synthetic drugs’
8. V. K. Ahluwalia, M. Kidwai ‘New trends in Green Chemistry’, Anamaya Publishers.
9. V. Kumar, ‘Introduction to Green Chemistry’, Vishal Publishing House.

Further Reading

1. P. Y. Bruice, ‘Organic Chemistry’, Pearson Education.
2. J. March, ‘Advanced Organic Chemistry’, John Wiley & Sons, NY
3. S. H. Pine ‘Organic Chemistry’, McGraw Hill
4. J. Clayden, N. Greeves, S. Warren and P. Wothers, ‘Organic Chemistry’, Oxford UniversityPress

SEMESTER VI
6B15CHE PHYSICAL CHEMISTRY III

Credit 3

Contact hrs 72

UNIT 1 Electrical Conductance (15 hrs)

Ohm's Law – Electrical energy – volt – coulomb – Mechanism of electrical conduction – Arrhenius theory – The laws of electrolysis – Faraday's law and its significance – Transference Number – Determination by Hittorf's method and moving boundary method. Equivalent conductance and Molar conductance Effect of Dilution on conductance – Effect of dielectric constants of solvents – Ionic mobilities – Kohlrausch's Law – applications – Mobilities of Hydrogen and Hydroxyl ions – Diffusion and ionic mobility.

Activity and activity coefficient – standard state ionic activities and activity coefficient – ionic strength – Debye – Huckel Theory – Ionic atmosphere – Debye – Huckel limiting law – determination of solubilities by conductance measurements – conductometric titrations – conductance in non-aqueous solvents – Temperature dependence of ionic conductance.

UNIT 2 Ionic Equilibria (14 hrs)

Acids and bases –Arrhenius Concept- Lowry – Bronsted concept – Dissociation of acids and bases – Lewis concept of acids and bases – hard and soft acids and bases and its applications – Ionic product of water – Dissociation constants of acids and bases – pH and its determination – Heat of neutralization – Incomplete neutralization – Hydrolysis of different types of salts – Degree of hydrolysis and hydrolytic constant – and its relation with pH and pOH – Buffer solution – pH of Buffer solution – Henderson's equation – Buffer capacity – Application of buffer – Acid – base indicators –Theory of acid – base indicators.

UNIT 3 Electromotive Force (20 hrs)

Electrochemical cell-Daniell cell – Reversible and Irreversible cell – Single electrode potential – EMF of cells – Standard potential and standard emf – Standard Hydrogen electrode and calomel electrode – Types of electrodes – electrode reaction – cell reaction Nernst equation for electrode potential and emf of the cell – Electrochemical series – IUPAC sign convention – Application of Gibb's Helmholtz equation to galvanic cells – Calculation of ΔG, ΔH, ΔS and equilibrium constant from emf data – The standard cells – Weston Cadmium cell and its emf. Concentration cells – Electrode and electrolytic concentration cells with and without transference and their emfs – Liquid junction potential – Elimination of liquid junction potential – salt bridge – application of potential measurements – Determination of solubility product, ionic product of water, transport number and the pH value – Hydrogen, Quinhydrone electrode and glass

electrode – potentiometric titration – redox indicators — Fuel cells. (hydogen-oxygen, hydrocarbon-oxygen)

UNIT 4 Chemical Kinetics (15 hrs)

The rates of chemical reactions – Experimental techniques – rate laws and rate constant – Order and molecularity of reactions – Methods of determining the order of reaction – Integrated rate laws of zero order, first order and second order reactions — General integrated rate equation for nth order reaction - Zero and fractional order reactions - Half life –Examples of consecutive parallel and opposing reactions (first order only). Temperature dependence of reaction rates – Arrhenius equation – Interpretation of parameters – steady state approximation – Kinetics of unimolecular reactions –Lindemann's theory.

Theories of reaction rates – collision theory – Derivation of rate equation for second order reaction from collision theory – thermodynamic approach of transition state theory – Entropy activation.

Catalysis – Homogeneous and Heterogeneous catalysis – examples – Features of homogeneous catalysis – Enzymes – Michalis – menten mechanism. Heterogenous catalysis – Langmuir – Hinshelwood mechanism – Kinetics of unimolecular surface reactions.

UNIT 5 Photo Chemistry (8hrs)

Photochemistry – consequences of light absorption – The Jablonski diagrams – Radiative and non radiative transition – Light absorption by solutions – Lambert – Beer Law – Laws of photochemistry – The Grotthus – Draper law – Stark – Einstein law – Quantum efficiency / Quantum yield – Experimental determination of quantum yield – High and low quantum yield - Photochemical rate law – Energy transfer in photochemical reactions – Photo sensitisation and quenching – Chemiluminescence – Lasers – uses.

References

1. Physical Chemistry : P.W. Atkins, Oxford University Press.
2. Physical Chemistry : Puri, Sharma and Pathania, Vishal Publishing Co.
3. A Text book of Physical Chemistry: A S Negi and S C Anand, New Age International Publishers.
4. A Textbook of Physical chemistry: K. L. Kapoor, Volumes 1 &5, Macmillan India Ltd.
5. Advanced Physical Chemistry: Gurdeep Raj, Goel Publishing House, Meerut.
6. Physical Chemistry: W.J. Moore, Orient Longmans.
7. Physical Chemistry: N. Kundu & S.K. Jain, S.Chand & Company.
8. Physical Chemistry : K. J. Laidler, John H.Meiser,
9. Chemical Kinetics : K.J.Laidler, Pearson Education.
10. Physical Chemistry : P C Rakshit
11. Electrochemistry: Samuel Glasstone

SEMESTER VI

6B16CHE PHYSICAL METHODS IN CHEMISTRY

Credit-3
Contact hours-54

UNIT 1 Spectroscopy (15 Hours)
Introduction: electromagnetic radiation, regions of the spectrum, interaction of electromagnetic radiation with molecules, Born-Oppenheimer approximation.

Microwave Spectroscopy – Rotation spectra-Instrumentation- Moment of inertia, Rotational Quantum numbers, Rotational Constant, Intensities of rotational spectral lines, Rotational – Vibrational Spectrum of diatomic molecules – Selection rules for rotational spectra.

Infrared Spectroscopy – Instrumentation -Theory of infrared spectra, Sampling techniques, Selection rule, Molecular vibration – Stretching and Bending modes, Calculation of stretching frequencies –Fundamental Bands and Overtones, Factors influencing vibrational frequency – Electronic effects, hydrogen bonding, solvent effect . Applications of IR Spectroscopy .
UV Spectroscopy –Absorption laws, Selection Rules – Types, Electronic transitions – Position and Intensity of absorption, Molar extinction coefficient, Chromophore – Auxochrome Concept, Absorption and Intensity Shifts, Types of Absorption Bands, Interpretations of spectra of simple conjugated dienes and enons, Woodward-Fieser Rule, Application to dienes and enons.

UNIT 2 (15 Hrs)
Raman Spectroscopy – Instrumentation, quantum theory of Raman scattering- Stokes and anti stokes lines-classical theory of Raman scattering-concept of polarizability-selection rules,rule of mutual exclusion.
NMR Spectroscopy – Instrumentation- Introduction, Theory of NMR, Phenomena of resonance, Modes of nuclear spin-Relaxation Process, Chemical Shift – Internal standard, δ and τ scale, Shielding Effects, Factors affecting Chemical Shift, Spin-Spin interaction, Interpretations of spectra of ethyl bromide,ethanol,acetaldehyde,acetone,toluene,acetophenone.
Mass Spectrometry – Basic principles, Instrumentation, Fragmentation pathway, Molecular ion peak, base peak, Meta stable ion, General rules for predicting the prominent peaks, Mc Lafferty Rearrangement, Mass spectra of alkanes, cyclo alkanes, saturated alcohols and aliphatic ketones.

UNIT 3 Instrumental Methods (11 hours)

Polarography : Dropping Mercury Electrode, Polarization – Concentration polarization, Half wave Potential and Diffusion current (Significance), Ilkovic equation, Advantages of polarographic analysis – Applications.

Amperometry : Amperometric Titrations, Instrumentation- Procedure, Biamperometric Titrations – Advantages and disadvantages, Applications.

Atomic Absorption Spectroscopy : Flame Atomization and Flame Structure – Hollow Cathode lamp, Interference.

Spectrophotometry : Instrumentation of photocolorimeter and spectrophotometer-block diagrams with description of components-Beer- Lambert law – Application- and its limitations- Colorimetric Methods – general procedure for colorimetric determination.

UNIT 4 Molecular Symmetry and Group Theory (6 hrs)

Symmetry of molecules-symmetry elements and symmetry operations – centre of symmetry, plane of symmetry, Identity – proper axis of rotation, improper axis of rotation – Schonflies notation – Point groups of simple molecules – Cnv, Cnh,H_2O,NH_3,N_2O_4,N_2F_2.

UNIT 5 Concepts and Applications of Nano Science (7 hours)

Introduction - Nanomaterials – synthesis – chemical precipitation, mechano-chemical method, micro emulsion method, reduction technique, chemical vapour deposition and sol-gel method (brief study)- Important methods for the characterization of nanomaterials – electron microscopy (SEM), transmission electron microscopy (TEM). Properties and applications of fullerenes - electrical and optical properties of carbon nanotubes(brief study).

References

1. Physical Chemistry – A molecular Approach: Mc Quarrie, J. D. Simon, Viva Books Pvt Ltd.
2. Fundamentals of molecular spectroscopy: C. N. Baanwell and E M Mc Cash, TataMc Graw Hill.
3. A Textbook of Physical chemistry: K. L. Kapoor, Volume 4, Macmillan India Ltd.
4. Physical Chemistry, I. N. Levine, Tata Mc Graw Hill.
5. Elements of Physical chemistry: Puri, Sharma and Pathania, Vishal Publishing Co.
6. Physical Chemistry, K. J. Laidler, John H.Meiser.
7. Physical Chemistry : P.W. Atkins, Oxford University Press.
8. Electronic absorption spectroscopy and related techniques: D. N. Satyanarayana, Universities Press.
9. Nanosciece and nanotechnology: V. S. Muraleedharan and A. Subramania, Ane Books
10. Nano; The Essentials: T. Pradeep, Mc Graw-Hill education.
11 Symmetry and spectroscopy of molecules: K.Veera Reddy, New Age International(P)

SYLLABUS OF B Sc CHEMISTRY PRACTICAL

SEMESTER III & IV

CORE COURSE PRACTICAL I (3B03CHE & 4B03CHE)

Volumetric Analysis **(** 72 hrs credit 2)

Introduction to Volumetric analysis

Equivalent and molecular mass of compounds. Normality and Molarity-Primary standards. Preparation of standard solution - Principles of volumetric analysis. For acidimetry, alkalimetry and permanganometry two burette method may be used and for other volumetric analysis conventional methods can be used.

1 Acidimetry And Alkalimetry

a)Estimation of NaOH/KOH using standard Na_2CO_3.

b) Estimation of $HCl/H_2SO_4/HNO_3$ using standard oxalic acid.

2 Permanganometry

a. Estimation of oxalic acid.
b. Estimation of Fe^{2+}
c. Estimation of Nitrite.

3 Dichrometry

d. Estimation of Fe^{2+} - using internal and external indicator
e. Estimation of Fe^{3+} - reduction of $SnCl_2$ – internal indicator

4 Iodometry And Iodimetry

f. Estimation of Cu^{2+} / $CuSO_4$ SH_2O.
g. Estimation of potassium dichromate.
h. Estimation of As_2O_3/As^{3+}

5 Precipitation titration-using adsorption indicators

Estimation of chloride in neutral medium

6 Complexometry

Estimation of Mg^{2+}, $Zn^{2+}$and hardness of water

7 Inorganic Preparation

a. Ferrous ammonium sulphate.
b. Potash alum.
c. Tetraammine copper(II) sulphate.
d. Potassium trisoxalato chromate.

Prepare any one sample in the examination and exhibit the product.

SEMESTER III & IV

(3B05CHE & 4B05CHE) Inorganic Qualitative Analysis

Credit 2

72hrs

1 Systematic qualitiative analysis of mixtures containing two anions by semi micro method. Study of the reactions of the following anions with a view to their identification, confirmation and procedure for elimination - carbonate, acetate, oxalate, fluoride, bromide, iodide, nitrate, sulfate, borate, phosphate, chromate, arsenate, arsenite. **One of the anion should be eliminating radical.**

2 Systematic qualitative analysis of mixture containing two cations by semimicro method. The cations mixtures must given as solution.

Study of the reaction of the following ions with a view to their identification andconfirmations.

Lead, bismuth, copper, tin, iron, aluminum, zinc, manganese, cobalt, nickel, barium, strontium, calcium, magnesium, NH_4^+

Note : minimum ten mixture should be analyzed and recorded.

SEMESTER V & VI

5B11 CHE & 6B11 CHE : GRAVIMETRIC ANALYSIS

Credit:3

Introduction to gravimetric techniques and its highlights.

1. Determination of water of hydration in crystalline barium Chloride.
2. Determination of barium as barium sulphate.
3. Determination of sulphate as barium sulphate.
4. Determination of iron as ferric oxide.
5. Determination of calcium as calcium carbonate.
6. Estimation of nickel as nickel dimethylglyoxime.
7. Determination of copper as cuprous thiocyanate.
8. Determination of magnesium as magnesium oxinate.

5B12 CHE & 6B12 CHE : ORGANIC CHEMISTRY

Credit:3

1. **Synthesis of Organic Compounds**.

a. Aromatic electrophilic substitution:

Nitration

Preparation of dinitrobenzene from nitrobenzene.

Preparation of p-nitroacetanilide

Halogenation –

Preparation of *p*-bromoacetanilide.

preparation of 2, 4, 6 – tribromophenol.

b. Diazotization and coupling :

Preparation of phenyl azo β-naphthol.

Preparation of methyl orange.

c.Oxidation :

Preparation of benzoic acid from benzyl chloride or benzaldehyde .

d.Esterification :

Benzoylation of phenol/aniline to phenyl benzoate.

e. Hydrolysis : Benzamide or ethylbenzoate to benzoic acid.

2. Organic Qualitative Analysis

a. Qualitative analyses with a view to characterize functional group/groups in the following compounds:

Napthalene, anthracene, chlorobenzene, bromobenzene, benzyl chloride, *p*- dichlorobenzene, benzyl alcohol, phenol, cresols, naphthols, resorcinol, benzaldehyde, acetophenone, benzophenone, benzoic acid, phthalic acid, cinnamic acid, succinic acid, salicylic acid, ethyl benzoate, methyl salicylate, benzamide, urea, aniline, toludines, dimethyl aniline, nitrobenzene, *o*-nitrotoluene, glucose, sucrose.

b. Preparation of derivatives.

Note : Minimum ten compounds should be analyzed and recorded. For analysis, reactions may be carried out in tiles, wherever possible.

3. Thin layer Chromatography and Column Chromatography

a. Preparation of the TLC plates – Checking the purity of the compounds by TLC – Acetylation of salicylic acid, aniline, Benzoylation of aniline and phenol, Determination of Rf. Values and identification of organic compounds by TLC, preparation and separation of 2, 4 –dinitrophenyl hydrazones of acetone and 2- butanone using toluene and light petroleum (40 :60).

b. Separation of ortho and para nitroaniline mixture by column chromatography.

4. **Demonstration Experiments** Steam distillation : Separation of ortho and para nitro phenols.

6B18CHE PHYSICAL CHEMISTRY

CREDIT: 3
Hrs/week: 5

1: Cryoscopy Using Solid Solvent

a) Cryoscopic constant of solid solvent using a solute of known molar mass (cooling curve method)
Solid solvents/solutes given: Naphthalene, Biphenyl, diphenyl amine.

b)Molar mass of the given solute, using solvent of known K_f.

Solid solvents/solutes given: Naphthalene, Biphenyl, diphenyl amine.

2: Transition Experiments (cooling curve method)

a) Transition point, depression constant (K_T) of the given Salt hydrate, using solute of known molar mass.
salthydrates: $Na_2S_2O_3.\ 5H_2O$./ $CH_3COONa.3H_2O$.
Solutes : Urea, Glucose,
b) Molar mass determination of given solute using salt hydrates of known (K_T)
Salt hydrates and solutes as above

3: Phase Rule Experiments
Critical Solution Temperature (C.S.T)
a) Critical solution temperature of phenol – water system
b) Concentration (% composition) of NaCl/KCl by C.S.T Measurements

4. Conductometry
a) Conductometric titrations
i) Strong acid x strong base
ii) Weak acid x strong base

5 : Potentiometry
a) Potentiometric titrations
i) Acid base titration (Strong acid, strong base)

6 : Distribution Law

Partition coefficient of I_2 between CCl_4 and H_2O

7. colorimetry

Verification of Beer-Lambert law for $KMnO_4$, determination of the concentration of the given solution.

8. Chemical Kinetics – Hydrolysis of methyl acetate using HCl acid.

Note:

1. A minimum number of 8experiment should be done
2. Electronic balance may be used for practical work.

VIVA VOCE

Viva voce examination based on practical will be conducted along with every practical examination.

REFERENCES

1. A.I.Vogel - A Text Book of Qualitative Analysis including semi-micro methods
2. V.V.Ramanujan – Semi micro Qualitative Analysis.
3. A.I.Vogel – A Text Book of Quantitative Inorganic Analysis.
4. A.I.Vogel - Elementary Practical Organic Chemistry.
5. A.O.Thomas – Practical Chemistry for B.Sc Chemistry.
6. A Findlay – Practical Physical Chemistry.
7. R.C.Das & E Behara – Experimental Physical Chemistry.
8. N.K.Vishnoi – Advanced Practical Chemistry.
9. Y.B. Yadav, Practical Physical Chemistry.

STUDY TOUR

Students are required to visit at least one Laboratory/factory/Research Institute of eminence during the course and submit the Study tour report separately along with practical records at the time of practical Exam (6^{th} Semester).

PROJECT REPORT:

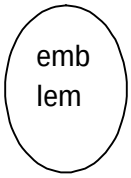
Students should undertake a group project work related to chemistry and submit the report along with practical records during VI semester practical. (Guide lines given in Annexure I)

General Guidelines of Project Work

1. Students should undertake the project work related to Chemistry only.
2. The UG level project work is a group activity, maximum number of students being limited to five. However each student should prepare and submit the project report separate.
3. The matter should be typed on A-4 size paper with Times New Roman font of size 12 points, with double spacing between the lines and margins of 1.5' at the left, 1' at the right, 1' each at the top and bottom.
4. The report should be printed in plain white paper in black ink only. Color inks for charts and graphs can be used, provided it does not hamper the readability. The logo of the college can be displayed in the report.
5. The project report should be hard bound/ spiral bound / paper back.

Format of the Project Report

Title

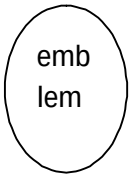


Name of the student

Department

College

Month & Year



Project Report

Submitted to Kannur Universityin partial fulfillment

for the B.Sc Degree(Chemistry)

By

Name of the student

Reg. No.

Name & Designation Project Guide:

Signature and Name of Head of the Dept.

Examiners

1.

2.

Page I : Certificate (By Project Guide)

Page2: Declaration (By Student)

Page3 Acknowledgement

Page4 . Contents

Chapter I : Introduction

Chapter II : Aim of the project/Problem Statement

Chapter III : Review

Chapter IV : The Study/Present work

Chapter V : Data Analysis/ Discussion

Chapter VI :Conclusion

Bibliography

MODEL QUESTION PAPERS FOR PRACTICALS

B.Sc CHEMISTRY PRACTICAL EXAMINATION

SEMESTER III & V- 3B03CHE &4B03CHE

PRCTICAL I VOLUMETRIC ANALYSIS

Time : 4 Hours **Maximum Marks:40**

Credit : 2

Instruction : candidate should submit bonafide record at the time of examination

1. Write down the Principle for the estimation of ……..given ……..
2. Calculate the weight of …….. required for the preparation of ……N,……ml solution.
3. Estimate the amount of …….. in the whole of the given solution provided with **……**solution and ……crystals.
4. Prepare the Inorganic complex…… Recrystallize and exhibit both crude and recrystallized samples.
5. Viva Voce

****

SEMESTER III & IV 3B05CHE & 4B05CHE PRACTICAL

II: INORGANIC QUALITATIVE ANALYSIS

Time: 4Hours **Maximum Marks: 40**

Credit: 2

Instruction : candidate should submit bonafide record at the time of examination

1. Analyse systematically the given mixture containing the anions and cations by semi-micro method.
2. Viva Voce.

****

SEMESTER V & VI 5 B 1 1 C H E & 6B11CHE

PRACTICAL III: *GRAVIMETRIC ANALYSIS

Time : 3 Hours **Maximum Marks:40**

Credit: 3

1 Write a brief outline of the procedure for the gravimetric estimation of …… ……..in the solution.……

2 Estimate gravimetrically the amount of ……..in the whole of the given……. Solution.

3 Viva Voce

****

SEMESTER V & VI 5B12CHE & 6B12CHE

PRACTICAL IV: *ORGANIC CHEMISTRY

Time : 3 Hours **Maximum Marks:40**

Credit: 3

1. Write down the procedure for the preparation of……..from……..
2. Analyse systematically the given organic compound with a view to identify the functional group present in it and submit a report of the procedure adopted. Suggest a suitable solid derivative for the compound and write the procedure for its preparation..
3. Convert the given ……..into…….Recrysttalise and exhibit both crude and recrystallised samples.
4. Viva Voce.

***Practical paper III & paper IV are to be conducted in the sixth semester for 6hrs on the second day.**

****

SEMESTER VI

PRACTICAL V : 6B18CHE PHYSICAL CHEMISTRY

Time : 4 Hours

Credit : 3

Instruction : Candidate should submit bonafide record at the time of examination.

Attempt the question marked **X**

1. Determine the molar mass of the given solute B by cryoscopic method. K_f of solid solvent A is ---------. Conduct a duplicate experiment.

2. Determine the rate constant for the hydrolysis of the given ester in the presence of the given acid. Calculate 5 k values. Obtain k value graphically.

3. Determine the Cryoscopic constant of the given solid solvent A using solute B of molecular mass--------- Conduct a duplicate experiment.

4. Determine the mass of HCl in the given solution conductometrically.

5. Write down the procedure for the experiment marked X within first 5 minutes.

6. Submit the Project Report & Report of Industrial visit.

7. VIVA VOCE

****

KANNUR UNIVERSITY

SYLLABUS

CHEMISTRY – OPEN COURSE

With effect from 2014 Admission

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

SEMESTER V

OPEN COURSE

5D01CHE : CHEMISTRY IN SERVICE TO MAN

Credit:2

Contact hours:36 Hrs

Aim: To create interest in studying the role of chemistry in overall development

Objectives:

1. To provide knowledge about the structure, properties and uses of plastics &polymers
2. To provide a brief idea about the role of chemistry in industry and agriculture
3. To make aware about the use and abuse of chemicals in daily life
4. To study about the chemistry of medicines
5. To provide knowledge about adverse effects in using polluted water and methods of treatment

1. PLASTICS & POLYMERS

Polymers- Types of polymers natural & synthetic polymers-characteristics and examples. General characteristics and applications of polymers such as Polythene (LDPE &HDPE), polypropylene, PVC, Poly styrene, Poly vinyl acetate, PET, Teflon, Terrylene, Nylons (Nylon 6,Nylone 66 & Kevlar), PMMA and Bakelite. Artificial fibers -examples

Plastics- Thermoplastics and thermosetting plastics- Characteristics and examples..
ElastomersNatural and synthetic rubbers-Vulcanization, Characteristics and uses of Buna, Butyl, Chloroprene ,SBR, Silicone & Thiokol rubbers. Biodegradable polymers .examples. benefits of biodegradable plastics. Importance of plastic recycling.

6 Hours

2. FERTILIZERS & INSECTICIDES

Natural , synthetic mixed and NPK fertilizers – examples.- making of NPK mixture - Impact of excessive use of fertilizers on environment – Bio fertilizers – plant growth hormones. Pesticides and their classification- examples. Excessive use of pesticides. Environmental hazards. Safe handling of pesticides. Insect repellants- Pheromones

5 Hours

3. FUELS, CELLS & BATTERIES

Defenition and classification of fuels – Characteristics of good fuel – Combustion - Calorific value – wood- coal – origin of coal- - petroleum-origin –fractional distillation –different fractions, their composition & uses. Natural gas, Biogas & LPG – their composition and uses. Pollution due to burning of fossil fuel Batteries and fuel cells – Different types – Applications in modern life.

5 Hours

4 CEMENT &GLASS

Cement- Classification – Portland cement – Raw materials – manufacture – setting and hardening –

Glass – Different types – manufacture – raw materials – manufacture of ordinary glass – annealing-

3 Hours

5. COSMETICS

Cosmetics – Cleansing cream,cold cream, bleaching &vanishing creams, perfumes, talcum powder, tooth paste, deodorants , lipstick –ingredients. Harmful chemicals in cosmetics

3 Hours

6 MEDICINES

Drugs- classification- Sulpha drugs - mode of actions ,examples and uses .Antibiotics- Discovery, examples and importance. Misuse of antibiotics.

Antipyretics ,analgesics and anti-inflammatory agents , narcotic analgesics Anesthetic, Antiseptic, Anti histamines and tranquillizers, - examples, and abuse..Disinfectant & germicides examples, .importance and uses.

6 Hours

7. WATER TREATMENT

Water sources – specifications for water- impurities in water- characteristics imparted by impurities – Hardness – Disadvantages of hard water in domestic and industrial use

Softening methods-lime soda, zeolite and ion exchange methods(principle only)- Drinking water or municipal water- methods of purification- removal of micro organisms- Desalination of brackish water-electro dialysis, reverse osmosis- Importance of dissolved oxygen, BOD & COD-Municipal Sewage treatment **8 Hours**

References:-

1. J Barrett**:** Chemistry in your environment-User friendly, Simplified Science.
2. Howard L White: Introduction to Industrial Chemistry
3. David M Targarden: Polymer Chemistry – Introduction to an indispensible science.
4. M.S.Yadav: Synthetic drugs
5. Samuel Delvin: Dyes and Pigments
6. Alexander Findlay: Chemistry in the service of man
7. S. K Honda: Principle of pesticide chemistry
8. M.M.Chakrabarthy: Chemistry and Technology of oils and fats
9. Shalini Sareen: Chemotherapeutic agents
10. P.K.Ray: Pollution and health
11. Vanessa Good ship: Introduction to plastic recycling
12. Randy Schmetter and Perry Romanoswski: Beginning cosmetic chemistry.
13. V Jain: Organic polymer chemistry
14. V K Selva raj: Advanced polymer chemistry
15. Jr Charles E Carraher: Introduction to polymer chemistry
16. Shashi Chawla: A Text Book of Engineering Chemistry
17. Jain & Jain : Engineering Chemistry

SEMESTER V

5D02 CHE DRUGS – USE & ABUSE

Credit:2
Contact hours:36 Hrs

Objectives:

1. Impart Knowledge regarding the history, classification uses of different drugs.
2. To provide a brief idea about the mode of action of drugs
3. To make the students aware about the side effects of modern drugs.
4. To create awareness regarding bthe misuse of drugs and its harmful effects.

INTRODUCTION

Drugs- Definitions, Classifications and examples of drugs- Roots of drug administrations,

Enteral, parentaral and topical routes. Bioavailibility of drugs -Advantage and disadvantage of various routes of administrations

5 Hrs

PHARMACOKINETICS and PHARMACO DYNAMICS

Definition of Pharmaco keinetics- A brief explanation of Absorption, Distribution- Metabolism (Biotransformation) and Excretion . First pass metabolism

Definition of Pharmaco dynamics- Modes of drug action, Receptors- Agonist ,Antagonist and Inverse agonists. Types of receptors (Brief explanation of types of receptors) , Dose response relationship ,Lethal Dose , EC 50 or ED 50 Therapeutic index , Types of Drug interactions , Drug tolerance, Placebo , Adverse drug reactions –

10 Hrs

SYNTHETIC DRUGS

Examples of Antipyretics , analgesics and anti inflammatory agents . A brief explanation of their mode of action . Anti biotics- Discovery and its importance. Examples of antibiotics –

Antibiotic misuse .Anti histamines- examples , Anaesthetics , anti malarial, Diuretics and anti-ulcer drugs . Chemotherapy

Drugs acting on Central Nervous System, Drugs acting on Peripheral Nervous System . Cardio vascular drugs classification and examples. **8 Hrs**

MISCELLANEOUS DRUGS

Antiseptics and disinfectants, Vaccines, chelating agents, Vitamins and Minerals, Enzymes and Hormones, Treatment in poisoning.

6Hrs

DRUGS OF ABUSE:-

Classification of drugs of abuse –Narcotic analgesic CNS Stimulants examples and effects, Depressants, Hallucinogens examples and effects, Sadatives, hypnotics example and effects ,Opioids, Cannabis and Inhalants examples and effects . Drug dependence, withdrawal symptoms , tolerance and addiction.

7 Hrs

References

1. Drugs – G.L. David Kurupadanam,Vijayaprasad,K Varaphiipatrasad Rao et.al.

2. Medical Pharmacology- Padmaja Udayakumar

3. Essentials of Medicinal Pharmacology - Tripathi

4. Medicinal Chemistry – Ashuthosh Kar

5.Dispensing Pharmacy –Kapoor & Gunn

6. A Text Book of Forensic Pharmacy – B.M. Mithal.

7. A Text Book of Organic and Pharmaceutical Chemistry - Wilson & Gisvold

SEMESTER V

5D03 CHE : ENVIRONMENTAL STUDIES

Credit:2
Contact hours:36 Hrs

Aim: To study about the environment, pollutants ,their effects and control measures Objectives:

1. To provide knowledge about the environmental segments,theirstructureandcomposition.
2. To create awareness regarding the source, effects and sink of pollutants in the environment.
3. To study about the energy recourses, the role of fuel consumption in environmental pollution, importance of energy management and search for eco-friendly and non-conventional energy sources.
4. To inculcate among the students importance of environmental protection, & environment friendly life style for a better living and better future.

UNITI.

Environmental segments – Lithosphere: soil formation – components of soils. Hydrosphere: Hydrological cycle , water and river water composition. Fresh water –surface water and ground water.- Biosphere- Atmosphere.- regions of Atmosphere- temperature and composition in different regions – Troposphere, stratosphere, Mesosphere, Thermosphere.

6 Hours

UNIT II

Air pollution –Sources – pollutants –CO, NOx, Sox, Hydrocarbons, Particulates. Effect on ecosystem., Ozone layer –importance, Ozone depletion-Control measures- Acid rain-control of acid rain- Green house effect-global warming,-photochemical smog- effect pollution on plants and human beings. Control of air pollution Noise Pollution – physiological response to noise, Noise categories- effect of noise – biological effects. **6 hours**

UNIT III

Water Pollution – Sources –Industrial effluents- agriculture discharge - oil spills-heavy metal - pesticides-biomagnifications and bioaccumulations-Experimental determination of dissolved

oxygen in water, chemical oxygen demand (COD) and bio chemical oxygen demand(BOD)- control of water pollution- ISI/BIS standards of drinking water. **6hours**

UNIT IV

Soil Pollution - Sources by industrial and urban wastes, radioactive pollutants, plastics heavy metals.Poisoning by heavy metals – Mina- matha & itai-Itai diseases. Control of soil pollution.- Solid waste Management -Thermal pollution definition-sources of thermal pollution , harmful effect of thermal pollution prevention of thermal pollution. **6 hours**

UNIT V

Sources of energy- fossil fuels, nuclear fission- Solar energy – use of solar energy in space-heating and water heating.- Production of electricity using solar energy. Solar trough collections-solar pond solar energy for driving vehicles, Power from indirect solar energy – Hydro power-wind power- Biomass energy. **6hours**

UNIT VI

Environment and public health- climate and health-Hazardous products – occupational hazards - infectious diseases- water borne diseases, vector borne diseases -Risks due to chemicals in food, cancer and environment.

Biotechnology and its application in environmental protection - biological de-odourisation, biological purification of contaminated air. **6 Hours**

References:

1. Text book of Environmental Studies for under graduate courses – Erach Bharucha
2. Essential Environmental studies- S. P. Misra – S. N. Pandey
3. Environmental chemistry and pollution control – S.S Dara (2nd edition)
4. Environmental chemistry- Peter O' Neill
5. Environmental chemistry – B.K. Sharma
6. Fundamental concepts of environmental chemistry – G.S Sodhi
7. Environmental Chemistry. A.K De

SEMESTER V

5D04CHE – NANOMATERIALS

Credit:2
Contact hours:36 Hrs

Aim: To Understand the fundamentals of Nano Science and Technology

Objectives:

1. To make an objective judgment of the scientific importance and technological potential of developments in micro- and nanotechnologies.
2. To perform a range of activities related to Nanoscience and Nanotechnology
3. To prepare the student to take the challenge of meeting national needs and international needs

UNIT 1.Definition and Scope of Nano Science 7 Hrs

Nanotechnology- Defenition, History-Timeline and Milestones, Overview of different nanomaterials available, Potential uses of nanomaterials in electronics, robotics, computers, sensors in textiles, sports equipment, mobile electronic devices, vehicles and transportation. Medical applications of nanomaterials.

UNIT 2. Nano Chemistry 10Hrs

Novel physical chemistry related to nanoparticles such as colloids and clusters: different equilibrium structures, quantum effects, conductivity and enhanced catalytic activity compared to the same materials in the macroscopic state.Exploitation of self-assembly and self-organization to design functional structures in 1D, 2D or 3D structures.Examples to emphasize on self-assembled monolayers.

UNIT 3 Synthesis of Nanomaterials 12Hrs

Nanomaterials (Nanoparticles, nanoclusters, quantum dots synthesis): Preparation and Characterization: "Top-Down" and "Bottom-Up" approaches of nanomaterial (nanoparticles, nanoclusters and quantum dots)

synthesis: Chemical Routes for Synthesis of Nanomaterials: Chemical precipitation and co-precipitation; Metal nanocrystals by reduction, Sol-gel synthesis; Solvothermal synthesis; Thermolysis routes, Microwave heating synthesis; Sonochemical synthesis;Electrochemical synthesis; , Photochemical synthesis, Synthesis in supercritical fluids,current state-of-the-art

UNIT 4 Applications of Nanomaterials 7Hrs

Solar energy conversion,storage and catalysis. Nanoelectronics, nanosensors, nanomedicine, nanobiotechnology, computational nanotechnology, Nanomagnetism, Carbon Nanotubes , Nanodevices,Spintronics, self cleaning nanoparticles.

References:

1. G.L.Hornyak, J.Dutta, H.F.Tibbals, A.K.Rao, Introduction to Nanoscience, CRC Press, 2008.

2. **A**.Nabok, *Organic and Inorganic Nanostructures*, Artech House 2005.

3. C.Dupas, P.Houdy, M.Lahmani, *Nanoscience: Nanotechnologies and Nanophysics*,Springer-Verlag Berlin Heidelberg 2007

4. Hari Singh Nalwa, *Nanostructured Materials and Nanotechnology*, Academic Press,2002

5. Nanotechnology- Richard Brooker,EARL Boyson- Wiley Dream Tech India

6. Advances in Nanoscience and Nanotechnology- Dr.Ashuthosh Sharma,Dr.Bellari- CSIR Publication 2004

7. Nanotechnology(Malayalam) – Anwar Sadath- DC Books

8. Nanochemistry: A Chemical Approach to Nanomaterials – Royal Society of Chemistry, Cambridge, UK 2005.

9. Chemistry of nanomaterials : Synthesis, properties and applications by CNR Rao et.al.

10. 'Handbook of Theoretical and Computational Nanotechnology, Eds. Michael Rieth.

KANNUR UNIVERSITY

SYLLABUS

CHEMISTRY – ELECTIVE

With effect from 2014 Admission

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

ELECTIVE COURSES

6B17CHE–A. ENVIRONMENTAL CHEMISTRY

Credits : 3 Total Contact Hrs : 54

OBJECTIVES:

1. To create awareness about the environmental issues
2. To the make students capable of analyzing the environmental problems and help the public to take the correct stand
3. To impart knowledge about modern techniques for analyzing environmental pollutants.

1. Environmental segments (10 hours)

Environmental segments: Lithosphere, Hydroshere, Atmosphere and Biosphere. Primary and secondary pollutants. Atmospheric temperature and composition at different regions. Percentage composition of waters and water cycle. Soil – factors affecting soil formation, components of soil and soil layers.

Chemical Toxicology – Toxic chemicals in environment – Sources, effects and treatment of heavy metal poisoning – Pb, As, Cd, Hg, Cr, Cu & Co. Minamata and Itai-Itai diseases.

2. Air Pollution (12 hours)

Air pollution – Air pollutants –CO, NOx, SO_2, H_2S, Hydrocarbons, particulate matter. Acid rain and its effects. Green house effect and global warming – climate change – ozone chemistry and ozone hole- chlorofluorocarbons, dioxins. Photochemical smog (reactions) – El Nino phenomenon. Bhopal gas tragedy.

Sampling – monitoring of air pollutants – Analysis of CO, NOx, SO_2, H_2S, Hydrocarbons and particulates. Control of air pollution – control by devices – Stacks, filters, electrostatic precipitators, cyclone separators, scrubbers and catalytic converters.

3. Water pollution (12 hours)

Water resourses, - water pollution – sources – Industrial effluents – agriculture discharge – oil spills – heavy metals – pesticides – detergents

Eutrophication – biomagnifications and bioaccumulation – experimental determination of Dissolved oxygen, BOD and COD – Thermal Pollution – Control of water pollution – ISI/BSI standards of drinking water. Hardness of water – causes and effects – methods of estimation – removal of hardness. Domestic water treatment – Sewage – Sewage analysis - Sewage treatment.

4. Soil Pollution (10 hours)

Lithosphere – soil formation – components of soils – Acid base and ion exchange reactions in soil – soil pollution – soil acidification – effects on plants – liming of soil – Industrial and urban wastes – plastics, pesticides and heavy metals in soil – garbage – biomedical waste – E waste – Municipal Solid waste management. Bioremediation.

5. Noise and Radiation pollution (10 hours)

Noise pollution and Radioactive Pollution : Human acoustics - Noise – general features -types of Noise – Measurement of noise – sound pressure and power levels – sources and effects of noise pollution – prevention of hearing loss in industry – control of noise pollution.

Radiation chemistry – Man made and natural radiations – biological effects of radiation – radiation hazards from reactors – radioactive waste management.

References:-

1. Environmental Chemistry, A.K.De.
2. Environmental Chemistry, P.S. Sindhu
3. Environmental Chemistry, B. K. Sharma
4. Essentials of environmental studies, S.P. Misra & S.N.Pandey
5. Advanced Inorganic Chemistry Vil. II , Gurdeep Raj
6. Engineering Chemistry , Dr. B.K. Sharma
7. Engineering Chemistry, Jain & Jain, Dhanpat Rai Publishing Company
8. A Basic course in environmental studies, Surinder Deswal & Anupama Deswal.

6B17CHE–B. APPLIED CHEMISTRY

Credits :3 Total Contact Hrs : 54

OBJECTIVES:

1 To create interest in application side of chemistry
2 To have awareness about daily and simple applications of chemistry daily life.
3 To impart idea about smart materials used in these smart world.

1. Water Chemistry (12 hours)

Water sources – specifications for water- impurities in water- characteristics imparted by impurities – Hardness – Disadvantages of hard water in domestic and industrial use. Softening methods-lime soda, zeolite and ion exchange methods (principle only)-Drinking water or municipal water- methods of purification- removal of suspended impurities, micro organisms-Desalination of brackish water-electro dialysis, reverse osmosis-Importance of dissolved oxygen, BOD & COD-Municipal Sewage treatment.

2. Fertilizer and Pesticide Chemistry (14 hours)

Pesticides – Classification – Chemistry of chlorinated organic compounds – Polychlorinated biphenyles – pesticides interfering with respiration – Lindane – polychlorinated cyclopentadiene derivatives – Auxins herbicides – long term effects of organochlorocompounds – organophospherous pesticides – Carbamates – Use of Pheramones and hormones – insect sterilization – color coding of pesticides – Handling of pesticides. Fertilizers- natural, synthetic, mixed, NPK fertilizers.

3. Food Chemistry (16 hours)

Classification – Lipid oxidation: autoxidation and metal catalyzed oxidation – Acid value – Rancidity in fats and oils – iodine value. Nutritional role of carbohydrates – effect of sugar on health – carbohydrate metabolism

Amino acids – classification- peptides and proteins- biomedical importance of peptides- functions and properties of peptides- denaturation and oxidation- classification of proteins- structure of proteins

Vitamins – Classifications, sources, biochemical functions and deficiency symptoms of vitamin A B_1,B_2,B_{12} C,D ,E and K.

Food additives – preservatives, saccharin, aspartame. Harmful effects of food additives. Chemicals present in Soft drinks and their effects.

4. Smart Materials (12 hours)

Shape memory alloys, Piezoelectric materials, Electrostrictive and Magnetostrictive materials, Thermochromic and photochromic, pH-sensitive Polymers, Halochromic materials, Photomechanical materials, Self-healing materials, Smart fabrics, Magnetic shape memory and Thermoelectric materials with examples. Nano devices.

References:

1. Engineering Chemistry, Jain & Jain, Dhanpat Rai Publishing Company
2. Food chemistry – H K Chopra and P S Panesar – Narosa Publishing House
3. The Chemistry of life – Harris L J – Cambridge University Press, New York
4. Organic Chemistry – Vol I and II , I L.Finar
5. Buchel, K.H. Chemistry of Pesticides, John Wiley & Sons, New York, 1983
6. P.C Pall, K. Goel, R.K Gupta, Insecticides,pesticides and agrobased industries
7. Smart materials, M.V. Gandhi, Brian S. Thompson, Champan and hall.
8. Engineering Analysis of Smart Material Systems, Donald J. Leo, John Wiley & Sons, New York

6B17CHE–C. POLYMER CHEMISTRY

Credits :3 Total Contact Hrs : 54

OBJECTIVES:

1 To know about types of polymers and polymerization techniques
2 To have knowledge about individual polymers.
3 To have an idea about the recent advances in polymer science.

1. Introduction. (16 hours)

Monomer & polymer, definition. Classification - natural, synthetic & semisynthetic, condensation & addition polymers, Homo polymers, copolymers, branched and crosslinked polymers, graft and block copolymers, composites, blends, elastomers, fibres, plastics, thermoplastic and thermosetting polymers. Tacticity in polymers-Isotactic, syndiotactic and atactic polymers. Properties: Glass transition temperature (Tg) - Definition- Factors affecting Tg - relationships between Tg and molecular weight and melting point. Importance of Tg.

2. Plastics, rubbers and fibres. (14 hours)

Preparation properties and applications of - Plastics: Polyethylene, Polyvinylchloride, polymethyl methacrylate PMMA, polyethylene terphthatalate PET, Teflon, Bakelite.

Rubbers: natural and synthetic rubbers - styrenebutadienerubber SBR, polybutadiene, polyisobutylene, butyl rubber, nitrile rubber, BUNA-S, BUNA N, neoprene rubber.

Synthetic fibres : Nylon 66, Nylon 6, Rayon.

3. Polymerisation Techniques (14 hours)

Types of polymerization- addition (initiation, propagation and termination), condensation, ionic (cationic & anionic), Ring opening polymerizations (epoxy resins) coordination polymerization – Ziegler Natta catalyst

moulding of plastics into articles- compression moulding-injection moulding-blow moulding—extrusion moulding

4. Advances in Polymers **(10 hours)**

Biopolymers - biodegradable polymers, Polymers in medical field. High temperature and fire-resistant polymers. Conducting polymers PAC, PPP, PPY etc -

Polymers used as adhesive and coatings, liquid crystalline polymers, Vulcanization of rubber. Environmental Hazards of plastics and recycling

References:

1. V.R. Gowariker, N.V. Viswanathan and Sreedhar, *Polymer Science*, Wiley Easern Ltd.
2. F.W. Billmeyar, *A text book of polymer science*, John Wiley & Sons, 1971.
3. Maurice Morten, *Rubber Technology*, Van Nostrand, Reinold, New York.
4. S. Paul, *Surface Coatings*.
5. B.K. Sharma, *Polymer Chemistry*, Goel Publishing House, Meerut.
6. M. Jenkins, *Biomedical Polymers*, University Birmingham, U.K.
7. M.G. Arora, M. Singh and M.S. Yadav, Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd.

6B17CHE–D. NANOCHEMISTRY

Credit: 3 **Contact hours: 54 Hrs**

OBJECTIVES:

1. For creating awareness in the field of nano particles
2. To perform a range of activities related to Nanoscience and Nanotechnology
3. To create idea about recent advances in nanotechnology

1. Introduction (10 hours)

Nanotechnology- Defenition, History- Timeline and Milestones, Classification based on dimensions (0D, 1D, 2D, 3D) and commercial use (carbon based, metal based, composites, dendrimers), Nanofabrication- "Top-Down" and "Bottom-Up" approaches.

2. Nano Synthesis (16 hours)

Top-down techniques: photolithography, other optical lithography (EUV, X-Ray, LIL), particle-beam lithographies (e-beam, FIB, shadow mask evaporation), probe lithographies, Bottom-up techniques: self-assembly, self-assembled monolayers, directed assembly, layer-by-layer assembly. Chemical Routes for Synthesis of Nanomaterials: Chemical precipitation and co-precipitation; Metal nanocrystals by reduction, Sol-gel synthesis; Microemulsions or reverse micelles, myle formation; Solvothermal synthesis; Thermolysis routes, Microwave heating synthesis; Sonochemical synthesis; Electrochemical synthesis; Photochemical synthesis, Synthesis in supercritical fluids.

3. Nanomaterial Characterizations (14 hours)

Characterization Techniques: Compositional surface analysis: XPS, SIMS. Microscopies: optical microscopy, fluorescence and confocal microscopy, TEM, SEM, Probe techniques: Scanning tunneling microscopy (STM), Atomic force microscopy (AFM), Scanning Nearfield Optical

Microscopy SNOM, Scanning Ion Conducting Microscopy (SICM). Ellipsometry, Neutron Scattering and XRD, Spectroscopic Techniques: UV-visible, FT-IR, Raman, NMR, ESR.

4. Applications of Nanomaterials (14 hours)

Solar energy conversion, storage and catalysis. Nanoelectronics, nanosensors, nanobiotechnology, computational nanotechnology, Nanomagnetism, Nanodevices, Spintronics, selfcleaning nanoparticles. Nanomaterials in electronics, robotics, computers, sports equipment, mobile electronic devices and cosmetics. Medical applications of nanomaterials.

References:

1. G.L.Hornyak, J.Dutta, H.F.Tibbals, A.K.Rao, Introduction to Nanoscience, CRC Press, 2008, ISBN: 978-1-4200-4805-6
2. A.Nabok, *Organic and Inorganic Nanostructures*, Artech House 2005
3. C.Dupas, P.Houdy, M.Lahmani, *Nanoscience: Nanotechnologies and Nanophysics*,Springer-Verlag Berlin Heidelberg 2007
4. Hari Singh Nalwa, *Nanostructured Materials and Nanotechnology*, Academic Press,2002
5. Nanotechnology- Richard Brooker,EARL Boyson- Wiley Dream Tech India
6. Advances in Nanoscience and Nanotechnology- Dr.Ashuthosh Sharma,Dr.Bellari- CSIR Publication 2004
7. Nanotechnology(Malayalam) – Anwar Sadath- DC Books
8. Nanochemistry: A Chemical Approach to Nanomaterials – Royal Society of Chemistry, Cambridge, UK 2005.
9. Chemistry of nanomaterials : Synthesis, properties and applications by CNR Rao et.al.
10. 'Handbook of Theoretical and Computational Nanotechnology, Eds. Michael Rieth and Wolfram, Schommers, 2006.
11. 'Handbook of Theoretical and Computational Nanotechnology, Eds. Michael Rieth and Wolfram Schommers, 2006.
12. Nanotubes and Nanowires- CNR Rao and A Govindaraj RCS Publishing.
13. Concepts in Spintronics – Sadamichi Maekawa
14. Spin Electronics – David Awschalom

KANNUR UNIVERSITY

SYLLABUS

GENERAL COURSE

POLYMER CHEMISTRY

With effect from 2014 Admission

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

SEMESTER III

3A11PCH POLYMER CHEMISTRY I

Credits: 3 Total Hours : 72

Module - 1 Introduction to Polymers (18 hrs)

Basic concepts- historical development- Present status - Basic concept of monomcrs- Functioiiality. Classification of polymers- Nomenclature- Natural and synthetic polymers -Organic and inorganic polymers-Thermoplastics and thermo sets Plastics, elastomers fibers and liquid resins-Addition polymers and condensation polymers-Homopolymers. And copolymcrs- linear, branched and cross linked polymers-graft and block co-polymers characteristic features of each.

Module-2 Commercial Polymers (20 hrs)

Manufacture, properties and applications of the following plastics - LDPE, HDPE, Polypropylene, Polystyrene PVC, PTFE, PMMA, PAN, Polyacrylic acid, Polymethacrylic acid.Polyamides -Nylon 6.6 and Nylon 6. Aromatic polyamides - Nomex, Kevlar. Polyesters -PET.Unsaturated polyesters. Polycarbonates - Acetal resins - Polysulphones - PPO Phenolic resins-Novalac formation - Resole formation. Urea - formaldehyde, Melamine formaldehyde resins.Cellulose - Cellulose based polymers - cotton, Rayon, Nitrocellulose - cellulose acetate,shellac, casein

Module-3 MoleculIar weight of PoIymcrs (14 hrs)

Importance of molecular weight - arithmetic mean - Number average, weight average, Viscosity average- Polydispersity and PDI-Molecular weight distribution in polymers and its importance from the point of application - Degree of polymerization- Molecular weight mechanical properties.

Module - 4 Characterization of Polymers (20 hrs)

Molecular weight determination-Method based on colligative property measurements cryoscopy- ebullioscopy -osmometry - membrane osmometry -vapour-pressure osmometry Methods based on viscosity. Measurements -viscometry -Light scattering method ultracentrifuge technique - End group analysis - GPC method.
Thermal methods of analysis in polymers TGA. DTA, DSC.

SEMESTER III

3A12PCH POLYMER CHEMISTRY II

Credits: 3 Total Hours : 72

Module - 1 Techniques of Polymerization (16 hrs)

Bulk polymerization - Solution polymerization - Suspension polymerization - Emulsion polymerization - Advantages and disadvantages of these techniques - comparison of the above.Batch and continuous process.

Module-2 Chemistry of Polymerization (22 hrs)

Addition polymerization -Free radical polymerization -Initiation, Propagation and termination - inhibitors and retarders.Ionic polymerization -cationic and anionic -Living polymers. Co-ordinationpolymerization - Zeigler -Natta catalysts.Condensation polymerization -Extent of reaction and DP -Carother's equation and its significance. Three dimensional polymerization -cross linking -gel point -Ring scission polymerization.

Module-3 Kinetics of Polymerization (18 hrs)

Kinetics of free-radical polymerization -Kinetic chain length and DP. Derivation for rate expression and expression for kinetic chain length and hence degree of polymerization.Kinetics of polycondensation with polyester as example. Simple kinetic expression - catalysed and uncatalysed polycondensation.

Module-4 Polymer Solutions (16 hrs)

Criteria of solubility of polymers-Thermodynamics of polymer dissolution- effect of molecular weight on solubility - polymer fractionation - Fractional precipitation technique -Partial dissolution technique - Gel permeation chromatography-Gradient elution technique.

Polymer I & II Reference Book

1. Text book of polymer science - P.L Nayak and S. Lenka
2. Physical Chemistry of polymers - A Tager
3. A text Book of Polymer Science - F. W. Billmeyer.
4. Polymer Science - V.R. Gowariker, N.V. Viswanathan, J. Sreedhar
5. Principles of Polymers Chemistry - P.J. Flory
6. Rubber Technology - Maurice Morton

7. Rubber Technology and manufacture - C.M. Blow
8. Synthetic rubbers. - D.C Blackley
9. Hand book of rubber Test method - Plastic test method - R.P. Brown
10. High performance Polymers, their origin and development – Seymour R.B.Klrschenbaun, G.S. Elsevier.
11. Principles of polymerization - F. Rooriquez.
12. Polymer Chemistry - M.G Arora & M. Singh
13. Mechanical properties of polymers and composites - L.E. Nielsen, marcel Dekker
14. Experiments and calculations in engineering chemistry - S.S. Dara
15. Principles of polymerisation, P. Bahadhur, N.V. Sastry, Narosa Publishing House, New Delhi - 2002

SEMESTER IV

4A13PCH POLYMER CHEMISTRY III

Credits: 3 Total Hours : 72

Module 1 Natural & Synthetic rubbers (20 hrs)

Natural rubber structure and properties of NR - trans polyisoprene. Manufacture, general properties and applications of SBR, Polyisoprene, Polybutadiene, Butyl rubber. Ethylene-propylene rubber. Neoprene rubber, Speciality rubbers: Silicon rubbers. Nitrile rubbers, polyacrylic rubbers, polyurethane rubbers, Hypalon, reclaimed rubber, foam rubber.

Module 2 Latex Technology (20 hrs)

Rubber latex -Latex processing - Preserved field Latex-Latex concentration by processes like centrifuging and creaming -Preparation of Ribbed Smoked Sheets - Technically specified forms of rubber - Superior processing rubbers-Latex compounding - additives used – manufacture techniques of rubber goods from latex -dipping -casting and moulding-Latex form rubber. Rubber processing - Mastication -Additives used in rubber compounding. Vulcanization -Sulphur vulcanization and non - sulphur vulcanization. Unique properties of Rubber.

Module 3 Molecular forces and chemical bonding in Polymers (18 hrs)

Crystallinity and amorphous behavior of polymers- Tacticity in polymers-Isotactic, syndiotactic and atactic polymers- Thermal transition in polymers- T_g and T_m - Thermal transitions and associated properties-Determination of Tg-Dilatometric method, Calorimetric method - Glass transition temperature and molecular weight - Importance of T_g - Plasticizers and their action. Secondary bonding forces that exist in polymers.

Module 4 Inorganic Polymers (14 hrs)

General properties - classification -Boron based polymers - Borazine, Polymeric boron nitride -Phosphorous based polymers -Polyphosphonitrilic chloride -polyphosphoric acids -Silicon based polymers – Organo tin polymers.

4A14PCH POLYMER CHEMISTRY IV

Credits: 3 Total Hours : 72

Module 1 Plastic Processing (20 hrs)

Basic principles of processing - shape and size -processing parameters - their effects and behavior -Rheology of ideal fluids and polymers. Polymer compounding - additives -fillers. Plasticizers. antioxidants. Flame retardants, stabilizers, colourants etc.

Process techniques: Injection moulding. Compression moulding, Transfer moulding. Blow moulding. Extrusion moulding Rotational moulding, Calendering, Foaming, Laminating. Coating, Casting, Spinning and Thermoforming.

Module 2 Polymer Degradation (14 hrs)

Type of degradation - Thermal degradation factors effecting thermal stability – Polymer degradation involving substituent groups-mechanical degradation– Photodegradation Photostabiiizers - Degradation by high energy radiation Oxidative degradation -antioxidants.

Module 3 Testing of Polymers and Polymer products. (18 hrs)

Need for testing. Need for Standards and specification -National and International standards - Organizations likeASTM, BIS. BS, DIN, ISO etc.

Mechanical properties: Short term strengths - Tensile properties, compression properties, flexural properties, shear properties.

Long term strength -m dynamic stress and strain properties and their measurements - creep, stress relaxation fatigue properties. Hexing and resilience.

Module 4 Special Topics in Polymer Science (20 hrs)

Blends/Alloys -Composites -Examples and application in engineering, biochemical, agriculture, defense and aerospace.

Specialty polymers -Bio medical polymers. Conducting polymers, engineering polymers- applications.

Plastic Waste management -Chemical recycling -incineration - Pyrolysis -mixed waste recycling - Types of recycling (1 °, 2°, 3° & quartemary - Basics) - Recycling codes – development for recycled materials.

Reference Books:

1. A text Book of Polymer Science - F. W. Billmeyer.
2. Polymer Science - V.R. Gowariker, N.V. Viswanathan, J. Sreedhar
3. Principles of Polymers Chemistry - P.J. Flory
4. Rubber Technology - Maurice Morton
5. Rubber Technology and manufacture - C.M. Blow
6. Synthetic rubbers. - D.C Blackley
7. Hand book of rubber Test method - Plastic test method - R.P. Brown
8. High performance Polymers, their origin and development - Seymour R.B. Klrschenbaun, G.S. Elsevier.
9. Principles of polymerization - F. Rooriquez.
10. Polymer Chemistry - M.G Arora & M. Singh
11. Mechanical properties of polymers and composites - L.E. Nielsen, marcel Dekker
12. Experiments and calculations in engineering chemistry - S.S. Dara
13. Principles of polymerisation, P. Bahadhur, N.V. Sastry, Narosa Publishing House, New Delhi - 2002
14. Hand book of Plastics Testing Technology -Vishu Shah, wiley interscience publications, 2nd edn. 1998
15. Synthetic rubbers, D.C. Blackley - Applied Science publisher London - 1983
16. Polymer Chemistry - Properties and applications, Andrew Peacock, Allison calhoun, Hanser Publishers, Munich 2006
17. Nabil Mustafa - “Plastic waste management” - Marcel Dekker Inc - 1993
18. Chandra. R and Adab. A. Rubber and Plastic waste, CBS Publishers & Distributers, New Delhi 1994

POLYMER CHEMISTRY II- PRACTICAL I

Credits: 0 **3A12(A)PCH** Total Hours : 36

1. Identification of Plastic and Rubbers (10 samples)

2. Preparation of Polymer - PMMA, Nylon6, 6., Polystyrene by mass polymerization, Polystyrene by Pearl polymerization, Polyacrylamide by Free radical polymerization, Polyacrylamide by Redox polymerization, Polyaniline, Phenol formaldehyde resin, Urea-formaldehyde resin, Aniline - formaldehyde resin.
   Preparation of Poly Vinyl Alcohol from polyvinyl acetate
   Preparation of cellulose acetate

4A13(A)PCH POLYMER CHEMISTRY III- PRACTICAL II

Credits: 2 + 2 Total Hours: 36

1. Latex Analysis-Determination of Dry Rubber Content, Total solid content, Ammonia Content, of latex
2. Relative Viscosity measurement of Polymer solutions
3. Analysis and estimation of phenolic group by bromination method.
4. Determination of mwt by Viscometer - polyvinyl Alcohol / Polystyrene
5. Determination of mwt by end group analyasis
6. Determination of acid value / and Hydroxyl value of polymers
7. Determination of chlorine content of PVC

Reference:

1. Experiments in polymer science, D.G Hundiwale, V.D. Athawale, U. R Kapadi, V.V. Gite New age International Pvt. Ltd - New Delhi - 2009

2. Polymer Chemistry - Practical approach in Chemistry, F.J. Davis, Oxford University press.

3. Polymer Science - V.R Gowarikar, N.V. Viswanathan, Jayadev Shredhar, New Age International Pvt. Ltd. New Delhi - 1997

4. Principles of Polymerisation - P. Bahadhur N.V. Sastry. Narosa Publishing House - New

Delhi - 2002

KANNUR UNIVERSITY

SYLLABUS

COMPLEMENTARY CHEMISTRY

With effect from 2014 Admission

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

Scheme--- Complementary Course (Chemistry)

No	Semester	Course code	Title of the course	Contact hour/ week	Credit
1	I	1C01CHE	Chemistry (For Physical & Biological Sciences)	2	2
2	II	2C02CHE	Chemistry (For Physical & Biological Sciences)	2	2
3	III	3C03CHE(BS)	Chemistry (For Biological Science)	3	2
4	III	3C03CHE(PS)	Chemistry (For Physical Science)	3	2
5	IV	4C04CHE(BS)	Chemistry (For Biological Science)	3	2
6	IV	4C04CHE(PS)	Chemistry (For Physical Science)	3	2
5	I,II, III&IV	4C05CHE*	Complementary Chemistry practical	2	4

* External examination will be conducted at the end of IV semester.

1C01CHE- CHEMISTRY

For Physical & Biological Sciences

2Hrs/week

Contact Hrs –36 **Credit -2**

UNIT I : Atomic Structure and Periodic Table (10 hrs)

Bohr atom Model (No derivation) – Atomic Spectra – limitations – wave mechanical concept of atom – Heisenberg's Uncertainty Principle – Dual nature of electrons – De Broglie equation – quantum numbers. Orbit and orbitals – Schrodinger equation (no derivation). The periodic table – periods and groups-s, p, d and f block elements – modern concept – periodic trends – atomic radii, ionic radii & covalent radii – effective nuclear charge and screening effect – Ionization potential – electro negativity and electron affinity.

UNIT II : Chemical bonding (10 hrs)

Ionic, covalent and co-ordinate bonds. Lattice energy of ionic compounds – Born Haber cycle. VSEPR theory and its applications. Shape of molecules CO_2, BeF_2, BF_3, CH_4, NH_3, H_2O, NH_4^+, PCl_5, SF_6, ClF_3. Orbital overlapping – Hybridization sp, sp^2, sp^3, sp^3d, sp^3d^2, d^2sp^3 and dsp^2 hybridization. V.B Theory. MO theory. Formation of B_2, C_2, N_2 and O_2 molecules. Hydrogen bonding, types of hydrogen bonding – example

UNIT III : Environmental Chemistry (10 hrs.)

Introduction-environment and segments- Pollutants of water – sewage, industrial effluents, soap and detergents, pesticides, fertilizers, heavy metals, Biological magnification and bioaccumulation, Toxic effect of pollutants, Water quality parameters – DO, BOD and COD, Water purification- sedimentation, coagulation, filtration, disinfection, ion exchange, desalination, Air pollution – major regions of atmosphere, pollution by oxides of N, S, C, hydrocarbons and other organic chemicals, automobile exhausts, their physiological effects on vegetation and living organisms, Ozone layer – importance – depletion of ozone – consequences, Greenhouse effect – global warming – acid rain, Toxicity and environmental hazards of pesticides, Radiation pollution and noise pollution.

UNIT IV : Electrochemistry (6 hrs)

Electrolysis – metallic and ionic conductors. Migration of ions – relative speed of ions – Transport number – determination of transport number using Hittorf's method. Kohlrausch's law and applications. Conductometric titrations – advantages. Ohms law – specific conductance – molar conductance and equivalent conductance – variation with dilution.

CHEMISTRY - 2C02CHE

For Physical & Biological Sciences

2Hrs/week

Contact Hrs – 36 **Credit - 2**

UNIT I : Chemical kinetics and catalysis (10 hrs)

Definition – reaction rate – factors affecting the rate of a chemical reaction – units – Zero order reactions – Order versus molecularity. Pseudo order reactions – Integrated rate equation for first order reaction – half life – determination of the order – Half life method and Graphical method – Ester hydrolysis – equation. Collision theory (qualitative) Effect of temperature on reaction rate – calculation of Ea from the values of k at two temperatures. Transition state theory (qualitative). Types of catalysis – homogeneous and heterogeneous. Characteristics of catalysis reactions – promoters and catalytic poisons. Activation energy and catalysis.

UNIT II : Chemical equilibrium (6 hours)

Reversible reactions – Law of mass action – relationship between K_c, K_p and K_x- thermo dynamic derivation of chemical equilibrium. Liquid systems – Le-Chatlier's Principle – Effects of temperature, pressure and concentrations.

UNIT III : Photochemistry (4 hrs)

Chemical reactions Vs Photochemical Reactions. Laws of photo chemistry – Grothus – Draper Law and Stark-Einstein law of photo chemistry. Quantum yield – Hydrogen Chlorine reactions. Photo sensitized reactions– Fluorescence and Phosphorescence – Chemiluminescence and bioluminescence.

UNIT IV : Colloids (8 hrs)

Classification – preparation – structure and stability – The electrical double layer – zeta potential – Properties of Colloids – Tyndall effect – Brownian movement- Coagulation of colloidal solution – Hardy-Schultz rule – Flocculation value – protective colloids – Gold number – Emulsions – oil in water and water in oil type emulsions – Emulsifying agents – Gels – imbibition – syneresis – applications of colloids in food, medicine and industry.

UNIT V : Analytical Chemistry (8 hrs)

Analytical chemistry – classification – accuracy and precision. Errors, Solubility product – ionic product – common ion effect - principle of separation of cations in various groups. pH pOH and ionic product of water. Buffer solutions – Hendersons equations. Principle of volumetric analysis – Adidimetry and alkalimetry, permanganometry, dichrometry, iodometry and iodimetry. Colorimetry – Beer-Lamberts law-applications.

CHEMISTRY-3C03CHE(BS)
For Biological Sciences

3Hrs/week

Contact Hrs –54 **Credit – 2**

UNIT I Co-ordination Chemistry (10 hrs)

Co-ordination compounds and complex ions –co-ordination number- unidentate- bidentate- polydentate ligands– Werners theory – Nomenclature of co-ordination compounds – Effective Atomic Number – Factors affecting the stability of complex ions – valence bond theory of complexes – application of complexes.

UNIT II : Introduction to organic chemistry (7 hrs)

Classification of organic compounds – functional groups, homologous series – Shapes of molecules like methane, ethane, ethylene and acetylene – nomenclature of hydrocarbons. Nomenclature of organic compounds bearing functional groups – Benzene structure – Aromaticity, Huckel's rule.

UNIT III : Organic reaction mechanisms (11 hrs)

Electron displacement effects - inductive effects – Electrometric effect. Resonance – Hyper conjugative effect and steric effect. Bond fission – Homolysis and heterolysis carbonium ion-carbanion and free radicals – their stability. Classifications of organic reactions – Mechanisms of SN_1 and SN_2 reaction. Walden inversion. Elimination reactions - E_1 and E_2 reactions. Addition of hydrohalogen acids – Markownikoff's rule – peroxide effect. Aromatic electrophilic substitution reactions. Mechanisms of chlorination, nitration, sulphonation and Friedel Crafts reaction – Orientation effect and o, p ratio.

UNIT IV : Stereochemistry (10 hrs)

Isomerism – general – stereoisomerism – optical isomerism – chirality – plane polarized light – specific rotation – enentiomerism – recemization – diastereo isomer – optical activity of lactic acid and tartaric acid – meso tartaric acid – resolution – conformational isomerism – ethane, propane and cyclohexane – chair and boat forms- stability – geometrical isomerism – causes – maleic acid and fumaric acid – 1-butene and 2-butene stability.

UNIT V : Introduction to Polymer Chemistry (8hrs.)

Types of polymerization: Chain polymerization, step polymerization – homopolymers and copolymers phenol formaldehyde, urea formaldehyde polymers – Natural rubber and synthetic rubbers – Synthetic fibers– Thermoplastics and Thermosetting plastics – pollution due to plastics – Biodegradable plastics.

UNIT VI : Thermodynamics (8 Hrs)

BASIC CONCEPTS – System – surroundings – open, closed and isolated systems – Isothermal – isochoric and isobaric process – work – heat – energy – internal energy – Heat capacity at constant volume (Cv) and at constant pressure (Cp) – relation between Cp and Cv – First law– The second law – Enthalpy-Entropy-and Free energy-Criteria for reversible and irreversible process-Gibbs – Helmholtz equation(no derivation)- concepts spontaneous and non spontaneous processes.

CHEMISTRY -3C03CHE(PS)

For Physical Science

3Hrs/week

Contact Hrs –54 **Credit – 2**

Module I : Spectroscopy (8 Hrs)

Electromagnetic spectrum- Ranges of different radiation- general features of spectroscopy- - Types of spectra – Rotational, vibrational and electronic spectra. Rotational spectra - Moment of intertia-rotational constant and bond length. Vibrational spectra – stretching and bending modes- Force constants-Zero point energy. Raman spectra – Stokes and Anti Stokes Lines – NMR spectra-chemical shift and spin-spin splitting.

Module II : Thermodynamics (5 Hrs)

BASIC CONCEPTS **–** System – surroundings – open, closed and isolated systems – Isothermal – adiabatic, isochoric and isobaric process – work – heat – energy – internal energy – Heat capacity at constant volume (Cv) and at constant pressure (Cp) – relation between Cp and Cv – First law– The second law – Enthalpy-Entropy-and Free energy-Criteria for reversible and irreversible process-Gibbs – Helmholtz equation(no derivation) concepts spontaneous and non spontaneous processes.

Module III : Metallurgy (6Hrs)

Metallurgy of aluminium, nickel, titanium and thorium**.**

Module IV : Co-ordination compounds (10 Hrs)

Co-ordination compounds and complex ions –co-ordination number- unidentate- bidentate- polydentate ligands– Werners theory – Nomenclature of co-ordination compounds – Effective Atomic Number – Factors affecting the stability of complex ions – valence bond theory of complexes – application of complexes.

.

Module V : Introduction to organic chemistry (7 Hrs)

Classification of organic compounds – functional groups,Homologous series – shapes of molecules like methane, ethane, ethylene and acetylene – nomenclature of hydrocarbons. Nomenclature of organic compounds bearing functional groups – Benzene structure – Aromaticity Huckel’s rule.

Reaction mechanism – electron displacement effect – inductive effects – electromeric effect – resonance – hyper conjugative effect – and steric effect – bond fission – homolysis and heterolysis – carbonium ion – carbanion – and free radicals – their stability.

M**odule VI : Nuclear Chemistry (10 hrs)**

Concept of nuclides – representation of nuclides – isobars, isotopes and isotones with examples – Detection of isotopes using Aston's mass spectrograph – separation of isotopes by diffusion methods – stability of nucleus – n/p ratio. Liquid drop model, Radioactivity – natural and artificial. Decay constant and half-life period-Radioactive series – Group displacement law – radio isotopes and their applications in structural elucidation, in agriculture and in industry – Radiocarbon dating – Nuclear fission and nuclear fusion. Problems associated in the nuclear waste disposal. Derivation of decay constant – Atomic bomb and hydrogen bomb. Mass defect, Nuclear binding energy.

Module VII : Organometallic compounds (8 Hrs)

Organometallic compounds – ionic compounds – compounds of elements of group 2 to 5 – compounds of transition elements – multicentric bonds with pi-bonded ligands – bonding in pi- metal complexes. Bonding in ferrocene – Reactions of C_5H_5 Rings – Grignard Reagent – Tetra ethyl lead.

CHEMISTRY -4C04CHE(BS)
For Biological Sciences

3Hrs/week

Contact Hrs –54 **Credit – 2**

UNIT I : Carbohydrates (8 hrs)

Introduction – Definition and classification. Synthesis and properties of Glucose, Fructose and Sucrose – Mutarotation – Epimers and Anomers. D and L configuration. Conversion of glucose into fructose and fructose into glucose. Canesugar – Structure and important properties – Polysaccharides. Starch, Cellulose and Chitin – structure, properties and tests.

UNIT II : Heterocyclic compounds (10 hrs)

Heterocyclic systems – 5 membered, 6 membered and condensed systems. Structure of pyrrole, Furan and Thiophene. Electrophilic substitution in pyrrole, Furan and Thiophene. Reactivity and orientation – Saturated 5 numbered heterocyclics – Structure and properties of pyridine. Electorphilic and nucleophilic substitution reactions in pyridine – Basicity and reduction. Quinoline and isoquinoline – preparation and properties.

UNIT III : Nucleic acids (7 hrs)

Classification – structure of DNA and RNA – Functions of Nucleic Acids – DNA replication – Bio synthesis of Proteins – Test for DNA and RNA. Effect of hydrogen bonding in biological systems.

UNIT IV : Amino acids and proteins (10 hrs)

Classification of Amino acids – Physical and Chemical Properties – Zwitter ions – Iso Electric point – Sorensons formal titration – chromatographic separation of amino acids – Peptides – Proteins classification, characterization by electrolysis – Primary, Secondary and Tertiary level structures of proteins – Tests for Proteins.

UNIT : Enzymes, Vitamins and Hormones (10 hrs)

Enzymes – General Nature – Mechanism of Enzyme action, Enzyme catalysis, Michaelis – Menten equation (No derivation) – Application of Enzymes, Enzyme deficiency deceases – Vitamins – Classifications structure of Vitamin A, B and C. Hormones – Classification – Structures of progesterone, Testosterone, cortisone, adrenaline and Thyroxine.

UNIT VII : Bio inorganic compounds (9 hrs)

Introduction – Metal ions in biological system – Metals in medicine – metal – nucleic acid interaction – biochemistry of iron – haemoglobin and myoglobin – structure and functions – mechanism of oxygen binding – Na-K pump – bio chemistry of Zn and Co- Ca in biological system.

CHEMISTRY-4C04CHE(PS)

For physical science

3Hrs/week

Contact Hrs –54 **Credit – 2**

UNIT I: Gaseous state (6 Hrs)

Ideal gas equation – deviation of gas laws from ideal behaviour – reasons for deviation – Van der Waals equation – critical constants and experimental determination – Maxwell distribution of molecular velocity — average, most probable and RMS velocities – problems.

UNIT II : Crystalline state (9 Hrs)

Solids – crystalline and amorphous solids – space lattice and unit cell- crystal planes laws of crystallography – Weiss indices and Miller indices - Bravais lattice – Bravais lattices of cubic crystals – characteristic planes in these lattices – interplanar distance ratio – X-ray analysis of crystals – Bragg's equation – problem – crystal structure of NaCl – Liquid crystals – types, properties and applications.

UNIT III : Electromotive force (8 Hrs)

Electro chemical cell – Daniel cell – Cell reaction – Single electrode potential – statement – explanation of Nernst equation – Standard hydrogen electrode – Calomel electrode – measurement of EMF – determination of pH using Hydrogen electrode – Potentiometric titration – concentration cells.

UNIT IV : Ionic equilibria (7 Hrs)

Oswald's dilution law – Debye – Huckel theory of strong electrolytes – Relaxation effect and Electrophoretic effect. Degree of dissociation. Common ion effect – Factors influencing degree of

dissociation. Solubility product. Salt hydrolysis. Quantitative aspects of salt hydrolysis – determination of degree of hydrolysis. Salts of strong acid and weak bases. Salts of weak acids and weak bases.

UNIT V : Binary Liquid Systems (7 Hrs)

Solutions – Types – Thermodynamic properties of a solution – condition for equilibrium between phases – ideal solutions – Raoult's Law – Vapour pressure of ideal solutions and real solutions – Boiling point diagrams of miscible binary mixtures. Distillation of binary miscible solutions – Azeotropes – Vapour pressure and distillation of immiscible liquids.

UNIT VI : Phase rule (6 Hrs)

Statement and expression of phase rule – Phase diagrams – Study of Water and Sulphur systems – Two component systems involving simple eutectic – Lead – silver system – Desilverisation of lead – Pattinson's process – Two component systems forming congruent melting point- Magnesium-Zinc system- Deliquescence efflorescence.

UNIT VII : Instrumental methods in Chemistry (11 Hrs)

Thermal methods of analysis – TGA mand DTA – instrumentation – application – characterisation of polymers. Spectrophotometry-basic instrumentation of UV – visible spectrophotometry – maximum optical density measurement – Atomic Absorption Spectroscopy- instrumentation- application- Electro analytical method – amperometry – amperometric titration – applications – advantages and disadvantages.

Reference Books

1.	Inorganic chemistry :	Puri and Sharma
2.	Inorganic chemistry :	P.L.Soni
3.	Concise inorganic chemistry :	J.D.Lee
4.	Basic inorganic chemistry :	Cotton and Wilkinson
5.	Physical Chemistry :	Puri and Sharma
6	Physical Chemistry	P.L.Soni and Dharmarah
7	Elements of Physical Chemistry	Glasstone and Lewis
8	University Chemistry	Bruce M Mahan and Rollie J Myers
9.	Basic Physical Chemistry	Moore W.J
10	Essentials of Physical Chemistry	Bahl,Tuli and Arun
11	Advanced organic Chemistry :	Jerry March
12.	Organic Chemistry	Morrison and Boyd
13	Environmental Chemistry	A.K.De
14.	Organic Chemistry Vol. 1 and II	I.L.Finar
15.	Polymer Chemistry	Gawarikar and Vishvanadhan
16.	Organic reaction mechanism :	Peter Sykes
17.	Organic reaction mechanism :	Mukherjee and Singh
18.	Organic photochemistry:	Depuy and Chapman
19.	Organic Spctroscopy	William Kemp
20.	Pragathi's Instrumental Methods of Analysis :	H.Kaur

4C05 CHE- COMPLEMENTARY CHEMISTRY PRACTICAL

1. **Qualitative Inorganic Mixture Analysis**

a. Reactions of cations:
Study of the reactions of the following cations with a view of their identification and confirmation.

Lead, Copper, Iron, Aluminium, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Magnesium and Ammonium.

b. Systematic qualitative analysis of a solution containing any two of the cations given in (a) by semi micro methods.

2. Volumetric Analysis

(a) Introduction to electronic balance and analytical balance – volumetric apparatus – filtration,Equivalent and molecular mass of compounds – Normality and Molarity – Primary standards – Preparation of standard solution – Principles of Volumetric analysis.

(b.) For acidimetry, alkalimetry and permanganometry two burette method may be used and for other volumetric analyses conventional methods can be used. (Students should prepare standard solutions. The experiments should have the making up of the given solution and double titration in each experiment.

a. Acidimetry and alkalimetry

Estimation of (a) strong acids (b) strong bases (c) weak acids (d) weak bases.

b. Permanganometry

Estimation of (a) Fe^{2+}/$FeSO_4.7H_2O$/Mohr's salt (b) Oxalic acid

c. Dichrometry

Estimation of (a) Fe2+ using internal indicator (b) Fe3+ after reduction with stannous chloride/HC1

d. Iodimetry and iodometry

Estimations of (a) copper (b) potassium dichromate and (c) Potassium permanganate.

VIVA VOCE

References

1.	A Text Book of Qualitative Analysis including semi micro methods	A.I.Vogel
2.	Semi micro Qualitative Analysis	V.V.Ramanujan
3.	A Text Book of Quantitative inorganic Analysis	A.I.Vogel
4.	Practical chemistry for B.Sc Chemistry	A.O.Thomas

MODEL QUESTION COMPLEMENTARY CHEMISTRY PRACTICAL

Time : 4 Hours

Credit: 4 **Total 32 marks**

1. Identify and confirm the two Cations in the given solution by systematic qualitative analysis. Submit a record of your tests, observation and inferences along with the report.

2. Determine the amount of HNO_3 in the Whole of the given solution You are provided with Pure Crystalline $H_2C_2O_4 .2H_2O$ and Approximately N/10 NaOH Solution

3. In the first ten minutes,

(a.) Write a brief outline of the procedure you would adopt for the estimation of Copper in the given solution of Copper Sulphate, given With A.R. potassium dichromate and N/10 Sodium thiosulphate

(b.) Calculate the mass of Copper Sulphate penta hydrate required to prepare 200 ml 0.2 N Solution

4. Viva Voce

****

Sd/

Dr. V.Geetha,

Chairperson, Board of Studies in Chemistry (UG)

Pattern of Question paper for U.G Core Courses (Chemistry)-Theory

KANNUR UNINERSITY

Reg. No.: Course code:
Name:
---------Semester

Course title..... **Programme.....**

Total marks: 40
Time: 3hrs.

Answer the questions in English only

Section A

(very short answer type - Each carries 1 mark -Answer all 4 questions)

1. very short answer type
2. very short answer type
3. very short answer type
4. very short answer type

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Short answer type question
6. Short answer type question
7. Short answer type question
8. Short answer type question
9. Short answer type question
10. Short answer type question
11. Short answer type question
12. Short answer type question
13. Short answer type question
14. Short answer type question

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Short essay/problem type question
16. Short essay/problem type question
17. Short essay/problem type question
18. Short essay/problem type question
19. Short essay/problem type question
20. Short essay/problem type question

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Long essay type question
22. Long essay type question
23. Long essay type question
24. Long essay type question

Model Question Paper for U G Core courses (Chemistry) – Theory

KANNUR UNIVERSITY

Reg. No.: Time:3hrs

Name: Max Marks:40

Semester -1 Theoretical & Inorganic Chemistry Course code:1B01CHE

Section A

(Answer all questions. Each question carries 1 mark)

1. What do you mean by precision in measurements?
2. State and explain Heisenberg's uncertainty principle.
3. What is mass defect?
4. State Fajan's rule.

Section B

(Answer any seven questions. Each question carries 2 marks)

5. What are Nodes? How many angular and radial nodes are in an orbital?
6. Account for the bond angles of $BeCl_2$, BCl_3, CCl_4, and NH_3 using VSEPR theory.
7. What are the factors affecting lattice enthalpy?
8. How accuracy and precision are related?
9. Which among the following has dipole moment? H_2O, CCl_4, $CHCl_3$, CO_2. Justify your answer.
10. Explain briefly about Photoelectric effect.
11. Explain nuclear Q value.
12. Sketch the shape of s ,p and d orbitals.
13. Arrange O_2, O_2^{2+} and O_2^{2-} in the increasing order of bond length.
14. Explain the stability of a nucleus in terms of n/p ratio and binding energy.

Section C

(Answer any 4 questions. Each question carries 3 marks)

15. List all possible sub shells and orbitals associated with principal quantum number n=3.
16. Draw the arrangement of all electron pair on the central atom CH_4, NH_3, H_2O and PCl_5.
17. Give the principle of Born – Haber cycle and explain its applications.
18. Explain the significance of quantum numbers.
19. Outline the working principle of Geiger-Muller counter.
20. What are nuclear reactors? How are they classified? Explain the working of a fast breeder reactor.

Section D

(Answer any 2 questions. Each question carries 5 marks)

21. (I) Describe the radio carbon dating technique.
    (II) Mention any 2 examples for the applications of radio isotopes in medical diagnosis.
22. Give Bohr Postulates and derive the expressions for energy of hydrogen atom.
23. Mention the common types of errors in analytical determination and write suitable methods for the reduction of such errors.
24. Illustrate the features of hybridization by taking suitable example

Reg. No.: Total Marks:40

Name: Time :3Hrs

Semester -II-Analytical Chemistry 2B03CHE

Section A

(Answer all questions. Each question carries 1 mark)

1. Identify the the conjugate acid-base pair in HF dissolved in H_2SO_4
2. What are the qualities of a salt which can be used as a primary standard
3. Explain the principle involved in gas chromatography
4. Why NH_4Cl is added during the group precipitation for group III analysis?

Section B

(Answer any seven questions. Each question carries 2 marks)

5. Write the principle involved in complexometric titration
6. Dilute solution of alkali metal in liquid ammonia are blue in colour &paramagnetic.Explain.
7. Explain leveling effect
8. Sketch the titration curve for Na_2CO_3 vs HCl
9. Mention the applications of adsorption chromatigraphy.
10. Explain HSAB principle.
11. Explain the principle involved in thermogravimetric analysis.
12. What is meant by redox titration? Why $KMnO_4$ is not used as a primary standard?
13. What do you mean by neutron diffraction method?
14. What is the difference between Iodometric and iodimetric titration.Give one example for each .

Section C

(Answer any 4 questions. Each question carries 3 marks)

15. Explain the theory and principle involved in TLC.
16. Discuss the importance of solubility product in qualitative analysis.
17. Explain the principle involved in thermometric titration.
18. Give some important reactions carried out in liquid SO_2
19. Explain the thermogram of calcium oxalate in an inert atmosphere.
20. What areLewis acids?arrange the following in the order of increasing acid strength
    i) H_2O ii)$CaCl_2$ iii)SO_3 iv)CO_2

Section D

(Answer any 2 questions. Each question carries 5 marks)

21. Briefly describe the unit operations involved in gravimetric analysis

21. What is the principle involved in solvent extraction? Explain the factors favouring and affecting extraction.
22. IllustrateThe charactrisation of polymers using DTG
23. Discuss the nature of bonding and stability of hard-hard and soft-soft acid base combinations.

KANNUR UNIVERSITY

Reg. No.: Total Marks:40

Name: III rd Semester Time:3Hrs

Course title: Organic Chemistry –I 3B04CHE

Answer the questions in English only

Section A

(Objective type - Each carries 1 mark -Answer all 4 questions)

1. Give the IUPAC names of
   a) C_2H_5-CH(OH)-CH_2-CO-CH_3 and
   b) C_2H_5-CH(CH_2OH)-CH_2-CH_2-CH_2OH
2. Write the structural formula of
   a) 3,4-Dimethylpentanal
   b) Methyl cyclopropane
3. What is 'electromeric effect'?
4. What do you mean by the term ' Homologous series'?

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Chloroacetic acid is stronger than acetic acid. Why?
6. Explain the hybridisation present in Ethyne.
7. Write the classification of dienes with examples.
8. Differentiate between singlet carbene and triplet carbene.
9. Explain Kolbe's electrolytic method for the synthesis of alkanes.
11. How is phenol synthesised from cumene?
12. Explain the chlorination of methane via free radical mechanism.
13. Give one method each for the preparation of ethylene dichloride and ethylidene chloride.
14. Explain Kharasch effect.

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. How is chloroform prepared from acetone? Explain with example.
16. Write short notes on :
   a) Resonance
   b) Hyperconjugation
17. Discuss Hofmann's rule and the Saytzeff rule of elimination with examples
18. Write a note on ozonolysis of alkenes and alkynes.
19. Discuss any two methods to distinguish primary, secondary and tertiary alcohols.
20. What products are formed in the following reactions? Illustrate with proper equations.
   a) 2-butyne treated with Selenium dioxide.
   b) Propylene treated with Baeyer's Reagent.
   c) Acetylene treated with water in presence of sulphuric acid and mercurous sulphate.

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. What are free radicals? How are they generated? Discuss their structure and stability.
22. Discuss the mechanism and stereochemistry of S_N1 and S_N2 reactions of alkyl halides.

23. Explain the following

a) Haworth Synthesis of naphthalene

b) Synthesis of Anthracene from benzyl chloride.

c) Wislicenus method for the synthesis of cycloalkane.

24. Discuss the mechanism of

a) Pinacol-Pinacolone rearrangement

b) Claisen rearrangement

[2x5=10 marks]

Model Question paper for U.G Core Courses (Chemistry)-Theory

4B06CHE- ORGANIC CHEMISTRY II

KANNUR UNIVERSITY

Reg. No.: Total marks: 40
Name: Time:3Hrs

Answer the questions in English only

Section A

(very short answer type - Each carries 1 mark -Answer all 4 questions)

1. Write an example for 3 membered ring which exhibits aromaticity.
2. What are the two cyclic forms of D-glucose ?
3. What is the hybridisation state of N atom in pyridine
4. Maleic and Fumaric acid are examples of which type of isomers ?

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Explain the molecular orbital theory of aromaticity.
6. Convert fructose to glucose
7. Discuss the reaction of fructose with phenyl hydrazine.
8. Compare the basicity of pyrimidine and pyridine.
9. Give two methods for the preparation of Indole.
10. Discuss the structure and aromaticity of pyrrole.
11. Explain racemization with examples
12. Explain specific rotation.
13. Write the synthesis and applications of polyethylene.
14. Write a short note on synthetic rubbers with example.

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Explain the aromaticity of cyclopentadienyl cation, cycloheptatrienyl cation and ferrocene
16. Explain epimerization using glucose
17. Draw the structure of sucrose. Explain whether it is reducing or non-reducing sugar.
18. Write the synthesis of quinoline by Skraup method and mention the reagents and its uses.
19. Explain ring opening polymerization using epoxy resins.
20. Write any three methods employed for the resolution of racemic mixtures

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Explain SNAr mechanism and Benzyne mechanism

22. Discuss the structure of glucose by means of configuration, cyclic structure and Haworth

    Representation.

23. a) Explain the optical isomerism of tartaric acid
    b) Explain the conformations of ethane with energy diagrams.
24. a) Explain condensation and addition polymerisations with examples
    b) Explain Hofmann's exhaustive methylation for the prediction piperidine structure.

Reg. No.:
Name: Total marks: 40
Time:3Hrs

V Semester B.Sc. Degree Examination Chemistry (Core course)

5B07 CHE: Inorganic Chemistry-I

Section-A

(Answer all questions. Each question carries 1 mark)

1. Give a method for the preparation of B_2H_6.
2. Name the different isotopes of Hydrogen – what is the nuclear spin of ortho hydrogen.
3. $SiCl_4$ is readily hydrolyzed but not CCl_4. Why?
4. Cupric salts are colored while cuprous salts are colorless. Why?

Section-B

(Answer any 7 questions. Each question carries 2 marks)

5. The first ionization energy of Be is greater than that of Lithium, but the position is reversed for the second ionization energy. Why?
6. What is inorganic benzene? How is it prepared?
7. Show that metal-metal bond exists in $Mn_{2(}CO)_{10}$
8. What are clathrates? Give 2 examples.
9. Give 2 uses of He and Ne.
10. Solution of alkali metals in liquid ammonia act as reducing agent. Why?
11. What is diagonal relationship? Explain with an example.
12. Explain the term inert pair effect with a suitable example.
13. The elements of the second period can show a maximum covalency of 4, while elements of the third and higher periods can show covalency higher than 4. Why?
14. List the various oxoacids of sulphur.

Section-C

(Answer any 4 questions. Each question carries 3 marks)

15. What are acidic, basic and amphoteric oxides? Give one examples for each type. Discuss the periodic trend in acid-base character of oxides of 'p' block elements.
16. What are crown ethers and cryptates? Give examples.
17. Discuss the classification and preparation of different types of hydrides.
18. What are refractories? How is silicon carbide prepared? Give 2 uses of it.
19. Define electro negativity. How will you calculate electro negativity by Pauling and Mulliken's method?
20. Describe the structure and bonding of Ferrocene.

Section-D

(Answer any 2 questions. Each question carries 5 marks)

21. Discuss the preparation and structures of
    (i) $Fe(CO)_5$ (ii) $Fe_2(CO)_9$ (iii) $Co_2(CO)_8$
22. Give a brief account of preparation, structure and bonding of
    (i) XeF_6 (ii) XeO_2F_2 (iii) XeO_3
23. Why are 'd block' elements called transition elements. Give their important characteristics.
24. What are inter halogens? Discuss the preparation and structures of any four inter halogen compounds.

V Semester B.Sc. Degree Examination

5B08 CHE: Inorganic Chemistry-II

Time: 3 Hours Max: 40 marks

Section-A

(Answer all questions. Each question carries 1 mark)

1. What is the most stable oxidation state of Cerium. Why?
2. Give the IUPAC name of a) $[K_4Fe(CN)_6]$ b) $[Co(NO_2)(NH_3)_5]Cl_2$
3. Give the name and composition of two nonferrous alloys.
4. What are the toxic effects of copper and lead in biological systems?

Section-B

(Answer any 7 questions. Each question carries 2 marks)

5. Distinguish between a double salt and a complex salt. Give one example for each.
6. What are the advantages of powder metallurgy?
7. What are the different methods used in the heat treatment of steel?
8. What is spectrochemical series?
9. What are metallo enzymes? Give 2 examples and their functions .
10. What are hemoglobin and myoglobin ?. Give their functions.
11. Write any two methods adopted for corrosion control.
12. State and explain EAN rule.
13. $[Ni(CN)_4]^{2-}$ is diamagnetic and square planar. Why?
14. What is meant by cooperativity effect in Hemoglobin?

Section-C

(Answer any 4 questions. Each question carries 3 marks)

15. Describe the electrochemical theory of corrosion.
16. Give 3 examples for alloy steels and mention their uses.
17. Discuss the stereochemistry of coordination compounds with coordination number 3 and 5.
18. What are Trans actinide elements? How are they produced? Name any 2 members of this group.
19. Explain the separation of lanthanides by ion exchange method.
20. Describe briefly about biological fixation of Nitrogen.

Section-D

(Answer any 2 questions. Each question carries 5 marks)

21. Discuss the splitting of 'd' orbitals in (i) octahedral complex (ii) tetra hedral complex (iii) square planar complex.
22. Describe the extraction of copper from its ore.
23. What is meant by stability constant of coordination compounds? Discuss the factors influencing the stability of coordination compounds.
24. What is meant by lanthanide contraction? What are the causes and consequences of it?

PATTERN OF QUESTION PAPER FOR U.G CORE COURSE (CHEMISTRY)

Reg No. ……. TOTAL MARK: 40

Name TIME:3 hrs

V SEMESTER

Physical Chemistry I: 5B09CHE

Section A

(answer all the 4 questions – each carries 1 mark)

1 What is the significance of "a" in the vanderWals equation?
2 Write the miller indices of a plane having intercepts 2a,2b,α.
3 For critical constant factor, what is compression factor Z .
4 Write down the expression for the osmotic pressure of the solution .

Section B

(short answer type – each carries 2 mark – answer 7 questions out of 10)

5 What are the significance of vander waals constants.
6 What is isotonic solutions? Write an example.
7 State and explain trouton's rule.
8 What is Hall effect? Explain.
9 Calculate the net number of particles per unit cell in fcc arrangement.
10 Explain why boiling point of a solvent is increased by the addition of a non volatile solute?
11 State the law of equipartition of energy.
12 Briefly explain the free volume theory of liquids.
13 What is liquid crystal? How it is different from normal crystals?
14 What do you meant by azeotropic mixture? Give one example.

Section c

(short essay type/problem type– each carries 3 marks –answer any 4 questions)

15. The total pressure exerted by a mixture of nitrogen,oxygen and argon is 100kpa, given the mole fractions of nitrogen and oxygen are 0.78 and 0.21 respecively. Calculate the partial pressure of all the three gases

15 A refraction from the (111) plane of a cubic crystal was observed at a glancing angle of 11.8 degree when X-rays of wavelength 154 pm were used. What is the edge length of the unit cell?

16 The molar heat of vapourisation of water at 100 degree celcius is 40.585KJ. at what temperature will a solution containing 5.60g of glucose in 1000g of water boil? Molar mass of solute=180g/mol, R=8.314J/K/mol

17. What do you meant by co-efficient of viscosity? Explain one method to determine the co-efficient of viscosity of a liquid?

19 what is super conductors? What are type I and type II super conductors. Give example

20 Explain the principles of steam distillation. Find the expression for molar mass from it.

Section D

(long essay type – each carries 5 mark – answer 2 questions out of 4)

21 a) Derive Brag's equation.(2)

b) KCl has rock salt structure. But X-ray diffraction studies shows that it has simple cubic lattice why? (1)

c) When a metal crystallizes in fcc,the edge length is found to be 3.5 angstrom and in bcc it is 3 angstrom. Calculate the ratio of the densities of metal in the fcc and bcc forms. (2)

22 a) What is optical activity and how it is measured? (3)

b) What is parachor? Give its two applications. (2)

23 a) Explain the determination of critical temperature and critical pressure. (3)

b) calculate the rms velocity of methane at 37 degree Celsius. (2)

24 a) What is colligative properties? (1)

b) Derive thermodynamically the depression in freezing point and calculate molecular mass expression from it? (4)

Reg. No.: Semester V Total marks: 40

Name: Time: 3hrs

Course title: PHYSICAL CHEMISTRY II 5B10CHE

Answer the questions in English only

Section A

(Each carries 1 mark -Answer all 4 questions)

1.Enthalpy of formation of ethanol at 298K is -277.8kJ $mole^{-1}$.Write down the thermochemical equation.

2. Calculate the work done when 20g of magnesium dissolves in HCl at 298K in an open beaker at 1 atmosphere.

3. What are azeotropes?

4. Define gold number.

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Differentiate between isothermal and adiabatic process.

6. Explain the Nernst Heat Theorm.

7. What are exoergonic and endoergonic reactions?

8. 5moles of PCl_5 was taken in a 2L vessel and allowed to dissociate.80% of PCl_5 dissociated when equilibrium was attained.calculate the equilibrium constant of the reaction,

$PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$

9. State and illustrate Hardy-Schuize rule.

11. Discuss the phase diagram of water system.

12.Calculate Kp/Kc for the reactions at 298K

$N_2(g) + O_2(g) \rightarrow 2NO(g)$

$NH_4Cl(s) \rightarrow NH_3(g) + HCl(g)$.

13. A monoatomic ideal gas at 200K is expanded isothermally to twice its initial volume.To what temperature should it be cooled to restore its entropy to its initial value? $C_v=3/2R$.

14. Distinguish physical adsorption from chemical adsorption.

.

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15.What are the assumption of Langmuir theory ?Derive the Langmuir adsorption isotherm..

16. Discuss the kinetic and electrical properties of colloids.

17.What is congruent melting point?Explain on the basis of phase diagram of $FeCl_3$-H_2O system

18. State distribution law.How is it useful in solvent extraction?.

19.Derive the Claussius-Clapeyron equation.How can we use it for the study of solid –liquid equilibrium.

20. State and explain the third law of thermodynamics. Explain how the absolute entropy of a gas is determined using the law.

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Derive vant Hoff reaction isotherm.

22. a)What is the change in boiling point of water at 373 K per Pa change in atmospheric pressure?The enthalpy of vaporisation is 40.69kJ mol^{-1} .molar volume of liquid water is $0.019x10^{-3}$ m^3 mol^{-1} and molar volume of steam is $30.199x10^{-3}m^3mol^{-1}$,all at 373K and 1atm.

b)Derive Gibbs-Duhem equation.

23.Obtain Kirchoffs equation. Show that Joule Thomson expansion is isoenthalpic process.

24.Derive Phase rule. B) Derive Gibbs-Helmholtz equation. [2x5=10 marks]

Model Question paper for U.G Core Courses (Chemistry)-Theory

VI SEMESTER 6B14CHE ORGANIC CHEMISTRY III

KANNUR UNINERSITY

Reg. No.: Total marks: 40
Name: Time:3Hrs

Answer the questions in English only

Section A

(Objective type - Each carries 1 mark -Answer all 4 questions)

1. β-Hydroxy aldehydes are generally known as
2. Write the chemical structure of citric acid
3. What is the Compound obtained on heating ammonium thiocyanate ?
4. Which aminoacid contains Indole nucleus ?

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Explain Wolf-Kishner and Clemensen reduction
6. What are the products obtained when cinnamaldehyde is treated with $LiA1H_4$ and $NaBH_4$
7. Write about antipyretics, analgesics, tranquillizers and antiseptics with examples each.
8. In Rosenmund's reduction the catalyst $Pd/BaSO_4$ is usually poisoned with sulpher. Give reason.
9. Give the industrial method of preparation (Fermentation) of lactic acid.
10. Explain the Order of basicity of aliphatic amines
11. What is Reformatsky reaction?
12. Write a short note on Norrish type I and II cleavages
13. Explain Isoprene rule
14. Give a short note on microwave and ultrasound assisted reactions.

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Write the different reactions of acetaldehyde with $NaHSO_3$, ethanol and semicarbazide.
16. How methyl magnesium bromide reacts with acetaldehyde, CO_2 and ethyl acetate.
17. Explain Blanc's rule and its importance.
18. Explain cycloaddition using Diels-Alder reactions.
19. What is Isoelectric point ? Explain the properties and importance of Zwitter ion
20. Give different principles of green chemistry with their explanations and examples

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Write the mechanism of Claisen condensation and Reformatsky reaction
22. Explain the 1^0, 2^0, 3^0 and 4^0 structure of proteins.
23. Write the classification of dyes based on structure and mode of applications
24. a) Distinguish 1^0, 2^0, 3^0 & 4^0 amines through Hoffmann's and Hinsberg's method.

    b) Explain Arndt-Eisert reaction with mechanism

KANNUR UNIVERSITY

Reg. No.: Total marks: 40
Name: Time: 3hrs

Course title: PHYSICAL CHEMISTRY III 6B15CHE

Answer the questions in English only

SECTION A

(Each carries 1 mark -Answer all 4 questions)

1 Define the term single electrode potential
2 Define ovevoltage
3 Explain the term quantum yield
4 What is meant by pseudo first order reaction? Give one example. **(4 x 1 = 4)**

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions)

5. What are fuel cells.
6. The solubility product of calcium oxalate in water at 298Kis 2 x 10^{-9} mol L^{-1}. Find the solubility of the salt in a .01M solution of ammonium oxalate.
7. For the Daniel cell reaction $Zn_{(s)} + Cu^{2+}_{(aq)} \rightleftharpoons Zn^{2+}_{(aq)} + Cu_{(s)}$ the standard free energy of formation of $Zn_{(s)}$, $Cu_{(s)}$, $Cu^{2+}_{(aq)}$ and $Zn^{2+}_{(aq)}$ are 0, 0, 64.4 and -154.0 KJ/mol respectively. Calculate the standard EMF of the cell.
8. What is the effect of dilution in the specific conductivity of a strong electrolyte ?
9. Explain one method used for the order of a reaction.
10. Differentiate between threshold energy and activation energy.
11. Explain the term photosensitization.
12. Distinguish between homogeneous and heterogeneous catalysts.
13. Discuss the working of a calomel electrode and explain how its potential depends on the concentration of Cl^- ion.
14. Why is an aqueous solution of ferric chloride acidic? **(7x2=14)**

Section C

(Each carries 3 mark -Answer 4 questions)

15. What are concentration cells? Explain the different types.
16. What is Kohlrausch's law ?Write any two applications of it.
17. The rate constant of a reaction is 1.78 x 10^{-4} L mol^{-1} s^{-1} at 19^0C and 1.38 x10^{-3} L mol^{-1} s^{-1} at 37^0C Evaluate Arrhenius parameters of the reaction.
18. Explain the application of conductance measurements in determining solubility of a salt.
19. Calculate the equilibrium constant for the reaction occurring in the cell. $Zn|Zn^{2+}(aq)||Fe^{3+},Fe^{2+}$ Pt.The standard electrode potentials are E^0 Fe^{3+},Fe^{2+} = 0.77V and - 0.76V. Comment on your result.
20. Outline the collision theory of reaction rate.

(4x2=8)

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions)

21. a) Give the principle used in the potentiometric titration of strong acid – strong base.
    b) A Zn rod is placed in 0.1M solution of $ZnSO_4$ at 25^0C. Assume that the salt is dissociated to the extent of 95% at this dilution. Calculate the potential of the electrode at this temperature. $E^0_{Zn^{2+}/Zn}$ = - 0.76V
22. a) What are the assumptions of Langmuir Theory. Derive the Langmuir adsorption isotherm.
    b) Write a note on surface films
23. Write notes on a)fluorescence b) phosphorescence and c)Chemiluminescence.
24. Outline Hittorfs method of determination of transport number.

6B16CHE : Physical Methods in Chemistry

Name:

Reg No: **Semester VI**

Time : **3** hours
Max. marks : **40**

Section A

*Answer **all** questions. Each questions carries **1** mark.*

1.Give the normal modes of vibrations of CO_2 moleecule
2. Write the Point group of water and ammonia molecule
3. Explain Beer Lamberts law
4. give any 2 applications of nanoparticles **(4x1 = 4)**

Section B

*Answer any **7** questions. Each questions carries **2** marks.*

5. Explain the effect of hybridization on the frequency of vibration.
6. State and explain Beer- Lamberts law.
7. Give advantages of amperometric titration.
8. Why TMS is used as an internal standard in NMR ?
9. Antistokes lines are less intense than stokes lines. Why?
10. Write any two chemical methods for the preparation of nanomaterials.
11. Differentiate between symmetry elements and symmetry operations.
12. Write down the Ilkovic equation and explain the terms.
13. What do you mean by meta stable ion?
14. What are auxochromes? Give examples. **(7x2=14)**

Section C

*Answer any **4** questions. Each question carries **3** marks.*

15. Explain the $\lambda_{(max)}$ values of ethylene (175nm), 1,3-butadiene(217nm), 1,3,5-hexatriene (250nm). Account for it.
16. How will you account for the appearance of prominent peaks at m/z 31, 42 & 70 in the mass spectrum of n-pentanol ?
17. Give the importance of half-wave potential in polarographic method.
18. What are the different factors affecting chemical shift?
19. What is the principle of AAS ?
20. Sketch the stretching modes of vibrations of CO_2 and H_2O. **(4x3=12)**

Section D

*Answer any **2** questions. Each question carries **5** marks.*

21. What do you mean by group frequencies in IR spectroscopy? What are the factors influencing vibrational frequencies?
22. Draw the typical titration curves in amperometric titration and explain?
23. Give the instrumentation of spectrophotometry.
24. Explain the properties and applications of carbon nanotubes.

(2x5=10)

Model Question paper for U.G Core Courses (Chemistry)-Theory

6B17CHE–A. ENVIRONMENTAL CHEMISTRY

KANNUR UNINERSITY

Reg. No.:
Name:

VI-------Semester

Total marks: 40
Time: 3hrs.

Answer the questions in English only

Section A

(Objective type - Each carries 1 mark -Answer all 4 questions)

1. In which region of atmosphere ozone layer is found ?
2. Give an example for primary and secondary pollutants
3. What is the full form of ISI ?
4. Which element is responsible for Minamata disease ?

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Mention the temperature and composition of different regions of atmosphere.
6. What are the different sources of soil pollution
7. What are the different health problems caused by Cd poisoning ?
8. What are the benefits of liming of soil ?
9. What are the biological effects of radiation
10. What are the different sources of mercury ?
11. Explain the harmful effects of noise pollution
12. Write a short note on Global warming.
13. Write a short note on acid rain
14. Write any method for the control of air pollution.

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Explain Hydrologic cycle.
16. Explain the different factors affecting soil formation.
17. Write a short note on ion exchange reactions in soil
18. Discuss the methods for the control of ozone depletion.
19. Explain Green house effect
20. What is El Nino phenomenon ?

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Explain bioremediation with its classification and examples.
22. Explain hardness of water. What are the methods employed for the removal of hardness.
23. Explain Biomedical waste, E-waste and Muncipal solid waste management.
24. Write a short note on BOD and COD and its determination.

Model Question paper for U.G Core Courses (Chemistry)-Theory

6B17CHE–B. APPLIED CHEMISTRY

KANNUR UNINERSITY

Reg. No.:
Name:

VI-------Semester

Total marks: 40
Time: 3hrs.

Answer the questions in English only

Section A

(Objective type - Each carries 1 mark -Answer all 4 questions)

1. Simple method used for the removal of temporary hardness is
2. Expand the chemical name of DDT
3. Vitamin C is otherwise known as
4. Materials which are able to return to their initial shape after deformation when heated is known as

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. What are the importance of dissolved oxygen ?
6. What are the disadvantages of hard water ?
7. Explain the colour coding of pesticides
8. What is meant by NPK value of fertilizers ?
9. What are carbamates ?
10. Write a short note on carbohydrate metabolism
11. Explain the rancidity in fats and oils.
12. Write a short note on harmful effects of food additives.
13. Give a short note on Piezoelectric materials
14. What are pH-sensitive Polymers ?

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Discuss the methods used for softening of water.
16. Give a short note on organophophorous pesticde.
17. What are the harmful effects of food additives ?
18. Write a short note on chemicals present in Soft drinks and their effects
19. Explain the classification of amino acids on the basis of structure
20. Write a short note on different types of nano devices

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. What are the methods employed for the desalination of brackish water ?
22. Explain the classification of pesticides
23. Explain Classification of Vitamins on the basis of sources and functions. Also explain deficiency symptoms of these vitamins.
24. Explain different types of smart materials with their applications.

Model Question paper for U.G Core Courses (Chemistry)-Theory

6B17CHE–C. POLYMER CHEMISTRY

KANNUR UNINERSITY

Reg. No.: Course code:
Name:
-

VI-------Semester

Total marks: 40
Time: 3hrs.

Answer the questions in English only

Section A

(Objective type - Each carries 1 mark -Answer all 4 questions)

1. What are the monomers used for the preparation of Nylon 66 ?
2. What is the chemical form of Ziegler Natta catalyst
3. Write the chemical formula for Isoprene
4. Give an example for semi synthetic polymer.

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Explain the classification of polymers on the basis of thermal and mechanical properties.
6. Write a short note on glass transition temperature.
7. Explain the tacticity in polymers
8. Write a short note on neoprene rubber
9. Write the importance of Ziegler Natta catalyst in polymerization
10. Write a short note on vulcunization of rubber
11. Explain coordination polymerization
12. What is Gutta Percha ?
13. Give a short note on biodegradable polymers
14. Give examples for high temperature and fire-resistant polymers.

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Explain condensation polymerisation with the preparation of PET
16. Write the mechanism of additional polymerization using PVC
17. Explain the preparation of phenol-formaldehyde resins and Bakelite.
18. Explain ring opening polymerisation with an example
19. Explain ionic polymerisation
20. Write a short note on the environmental hazards of plastics and recycling

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Explain Classification of Polymers on the basis of source, structure, composition and arrangement.
22. Explain the synthetic rubber with three examples
23. Explain different kinds of moulding processes.
24. Write the applications of polymers in different fields.

Model Question paper for U.G Core Courses (Chemistry)-Theory

6B17CHE–D. NANOCHEMISTRY

KANNUR UNINERSITY

Name:
Reg.No

VI-------Semester

Total marks: 40
Time: 3hrs.

Answer the questions in English only

Section A

(Objective type - Each carries 1 mark -Answer all 4 questions)

1. How many Angstrom units make one nanometre ?
2. What is the title of the speech given by the Physicist Richard Feynman
3. What is SICM ?
4. How many pentagons and hexagons are present in a C_{60} fullarene ?

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Explain Nanofabrication using Top-Down and Bottom-Up methods.
6. Suggest a Sonochemical synthetic method for the preparation of nano particles
7. Explain quantum dots with example
8. How nanotechnology plays important role in environment protection ?
9. What are the importanat applications of nano-optics ?
10. What are the methods adopted for the synthesis of nano polymers ?
11. Explain the phenomenon of Single Electron Tunnelling
12. Write briefly about any two scanning probe instruments
13. Give a short note Ellipsometry
14. What is Nanomagnetism

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Classify nano particles based on dimensions and commercial use
16. Account some chemical methods for the synthesis of nano particles
17. Explain the mechanical, thermal and optical properties of nano particles
18. Write a short note on self assembly of molecules
19. Explain computational nanotechnology
20. Write a short note on different types of nano devices

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Explain lithography using photolithography technique
22. Suggest some synthetic methods for the formation of nano particles
23. Explain some of medical and electronics application of nano materials.
24. Explain some of the methods for the characterization of nano materials.

Pattern of Question paper for U.G Complementary Courses (Chemistry)-Theory

Reg. No.: Course code:
Name:
---------Semester
Course title..... Programme.....
Total marks: 32
Time: 3hrs.

write only in English

Section A

(very short answer type - Each carries 1 mark -Answer all 5 questions)

1.
2.
3.
4.
5.

Section B

(Short answer type - Each carries 2 mark -Answer 4 questions out of 6)

6.
7.
8.
9.
10.
11.

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

12.
13.
14.
15.
16.

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

17.
18.
19.
20.

Model question Paper
Semester I
Complementary Chemistryl
For l Physical and BiologicaSciences **1CO1CHE**

Time: 3hrs Maximum: 32 Marks

SECTION A

Answer *all* questions.
Each question carries the marks of 1

1. Write down the electronic configuration of Cu and Cr.
2. Define faradays second law of electrolysis.
3. Write the equation for cell constant.
4. Define ohms law.
5. Define transport number. (1x5=5marks)

SECTION B

(Answer any *four q*uestions. Each question carries 2 marks)

6. Derive the de Broglie relation.
7. Distinguish between σ bond and π bond.
8. What are strong electrolytes? Write two examples.
9. How does ionization energy vary along a period?
10. The uncertainty in position of an electron is $1A^0$ What is the uncertainty in velocity (Mass of the electron=$9.1x10^{-31}$kg.)
11. Explain Green house effect. (2x4=8marks)

SECTION C

(Answer any *three* questions. Each question carries 3 marks)

12. Write a note on conductometric titration.
13. Explain the causes of global warming?
14. Give the outline of VSEPR theory and using the theory. Explain the shapes of XeF_2 and ClF_3.
15. Explain hydrogen bonding.
16. How is ozone layer naturally formed? Indicate the cause of its depletion and its results of depletion.

(3x3=9marks)

SECTION D

(Answer any *two* questions. Each question carries 5 marks)

17. What are quantum numbers? Discuss the significance of each quantum numbers.
18. Write a note on air pollution.
19. a) Briefly outline the salient features of molecular orbital theory
    b) Give the molecular orbital electronic configuration B_2 molecules
20. Define Kohlrausch's law of independent migration of ions. Explain its application.

(5x2=10marks)

SEMESTER II

Complementary Chemistry

For Physical and BiologicalSciences 2CO2CHE

Time: 3hrs Maximum: 32 Marks

SECTION A

Answer *all* questions.

Each question carries the marks of 1

1. Define chemical equilibrium.
2. Define Grotthuss-Draper law.
3. Define precision.
4. Define gold number
5. Give two examples for first order reaction. (1x5=5marks)

SECTION B

(Answer any *four q*uestions. Each question carries 2 marks)

6. A first order reaction completes 20% in 20 minutes. What time will it take to complete 60% at the same temperature?
7. Calculate the pH of 0.85M HCl which is 80% ionised
8. What is meant by the quantum yield of photochemical reaction?
9. What are protective colloids? Give two examples for the protective colloids.
10. Explain solubility product.
11. Describe the activated complexes. (2x4=8marks)

SECTION C

(Answer any *three* questions. Each question carries 3 marks)

12. Explain the phosphorescence?
13. Write a note on Tyndal effect.
14. Explain the classifications of errors.
15. Write a note on the applications of colorimetry
16. 10 moles of HI were heated in a sealed 5L bulb at 717K till equilibrium state was reached. It was found to that 25% of HI had dissociated by that time. Calculate the equilibrium constant for the reaction $2HI_{(g)} \leftrightarrow H_{2\,(g)} + I_{2\,(g)}$ (3x3=9marks)

SECTION D

(Answer any *two* questions. Each question carries 5marks)

17. Define the principle of mobile equilibrium. Apply it to contact process and Haber process.
18. Explain chromatography
19. a) Derive the integrated rate equation for the rate constant of a first order reaction.
    b) Describe the half life period of determining the order of the reaction
20. Explain (i) electrical double layer. (ii)Zeta potential
    (iii) Isoelectric point

(5x2=10marks)

SEMESTER III
Complementary Chemistry
For Biological Science 3CO3CHE(BS)

Time: 3hrs Maximum: 32 Marks

SECTION A

Answer *all* questions.

Each question carries the marks of 1

1. Define copolymers.
2. What is meant by aromaticity?
3. What are ligands?
4. Define specific rotation.
5. What are free radicals? (1x5=5marks)

SECTION B

(Answer any *four q*uestions. Each question carries 2 marks)

6. State and illustrate Hoffman's rule?
7. Give the IUPAC names of $[Co(NH_3)_4Cl_2]Cl$ (ii)$K_4[Fe(CN)_6]$
8. Discuss the second law of thermodynamics.
9. What are the functional groups present in (i) amide (ii) aldehyde (iii) acid chloride (iv)carboxylic acid
10. Explain the chemical method used for the separation of racemic mixture.
11. Explain the relation between Cp and Cv (2x4=8marks)

SECTION C

(Answer any *three* questions. Each question carries 3 marks)

12. Distinguish between isothermal, isochoric and isobaric process.
13. Explain the difference between thermosetting plastic and thermoplastic?
14. Give the postulates of Werner's coordination theory
15. Explain the structure of benzene.
16. Discuss the E_1 and E_2 mechanism of elimination reaction.

(3x3=9 marks)

SECTION D

(Answer any *two* questions. Each question carries 5 marks)

17. (a) Explain the types of polymerization
    (b) Write a note on biodegradable polymers.
18. (a)Explain the conformational isomerism with regard to cyclohexane and propane
    (b)Discuss the optical isomerism of tartaric acid
19. (a)What are the electrophillic substitution reactions in benzene?
    (b)Write down the mechanisms in each case?
20. On the basis of VBT, account for the the fact that $[Fe(CN)_6]^{3-}$ is weekly paramagnetic while $[Fe(CN)_6]^{4-}$ is diamagnetic

SEMESTER III

complementary course in chemistry

3CO3CHE(PS): FOR PHYSICAL SCIENCE

TIME : 3Hrs
Total marks : 32

Write only in English

SECTION A

(Answer all 5 questions, each carries one mark.)

1. Write the structural formula for the compound 3-Chloro-5,5-dimethylhexanal.
2. Name the compound $[Cr(NH_3)_3(H_2O)_3]Cl_3$.
3. Give the mathematical expression for second law of Thermodynamics.
4. Give one example for bi dentate ligand.
5. The most abundant metal in the earth crust.

SECTION B

(Answer any 4 questions .each carries 2 marks)

6. Point out any two methods for the concentration of ores.
7. What are the criterions for aromaticity?
8. Define the terms a) mass defect b) n/p ratio
9.. Half life period of Th is 24.4 min. How much element would be left after 30 min. If the initial concentration of Th is 1gm?
10. Write a note on multi centric bonds with suitable examples.
11. Differentiate between stokes and anti stokes lines.

SECTION C

(Answer any 3 questions: each carries 3 marks)

12.(a) Give Gibbs-Helmholtz equation
(b) Free energy is otherwise called the work function of a system. Justify the statement.
13. What are the significances of electron displacement effects in organic reaction mechanism?
14. Explain the applications of radioisotopes in the medicinal field?
15. Give the structure and bonding in ferrocene.
16. Discuss in detail about chemical shift and spin-spin coupling.

SECTION D

(Answer any 2 questions: each carries 5 marks)

17. (a) what are the steps involved in metallurgical process?
(b) Name the ore of titanium. How will you extract Titanium from that ore?
18. In the lights of VBT theory, explain the complex formation of $[Fe(CN)_6]^{4-}$
19. Comment on the uniqueness of benzene. How is it stabilized?
20. Discuss the social issues resulted by the nuclear wastes in the recent years.

SEMESTER IV

Complementary Chemistry

For Biological Science **4CO4CHE(BS)**

Time: 3hrs Maximum: 32 Marks

SECTION A

Answer *all* questions.

Each question carries the marks of 1

1. What are epimers?
2. Give two examples for condensed heterocyclic compounds.
3. Give the chemical names of vitamins A, B_1 and B_2
4. What are codons?
5. Draw the structures of Adrenaline and Thyroxine.

(1x5=5marks)

SECTION B

(Answer any *four q*uestions. Each question carries 2 marks)

6. Give one method for the preparation of isoquinoline
8. Explian the types of Hydrogen bonding in DNA
9. Hormones are called chemical messengers. Why?
10. Write a note on paper electrophoresis.
11. What is cis-platin? What are its important uses?

(2x4=8marks)

SECTION C

(Answer any *three* questions. Each question carries 3 marks)

12. What is meant by zwitter ion? How does is electric point influences the properties of the amino acid
13. How will you convert starch into (a) glucose and (b) maltose
14. Explain sodium-potassium pump.
15. Write short note on enzyme deficiency diseases
16. Give the reactions (a) Thiophene react with acetic anhydride in the presence of phosphoric acid (b) Oxidation reactions of quinolin (3x3=9 marks)

SECTION D

(Answer any *two* questions. Each question carries 5marks)

17.(a) Analyses the biochemical functions of hemoglobin and myoglobin

(b)Briefly explain the role of hemoglobin in the transport of oxygen and carbondioxide.

18. Explain the mechanism of Michaelis-Menten Theory
19. Explain the colour test for proteins

20(a) Explain the structure of furan

(b)Explain the reactivity and the aspect of orientation in the elecrophillic substitution reactions.

(5x2=10 marks)

SEMESTER IV

COMPLEMENTARY COURSE IN CHEMISTRY

4CO4CHE(PS): FOR PHYSICAL SCIENCE

TIME: 3 Hrs

Total Marks:32 SECTION A

Answer all questions Each carries 1 Mark

1. Expand SHE.
2. Give one example for acidic salt.
3. Give one reason for the deviation of gases from ideal behavior.
4. The solutions which are deviating from Raoult's law are called…….
5. Write the Bragg's equation.

SECTION B

ANSWER ANY 4 QUESTIONS: EACH CARRIES 2 MARKS

6. Differentiate between crystalline and amorphous solids.
7. What were the reasons which led van der Waal to modify the ideal gas equation?write down the modified equation.
8. Construct the phase diagram for water.
9. Calculate the hydrolysis constant (K_h) and degree of hydrolysis (α) of NH_4Cl in 0.001 solution.($Kb=1.8\times10^{-5}$;$Kw=1.0\times10^{-14}$)
10. Point out the applications of electro analytical method.
11. State Ostwald dilution law.

SECTION C

(ANSWER ANY 3 QUESTIONS: EACH CARRIES 3 MARKS.)

12. Explain the properties and applications of liquid crystals.
13. Write a note on the working principle of calomel electrode.
14. (a) Distinguish between absolute temperature and critical temperature. (b) Calculate the rms velocity for oxygen molecule at 26.85^0C given that gas constant $R=8.314\times10^7$ ergs mol^{-1} dg^{-1}.
15. Draw and interpret the boiling point diagram of miscible binary mixtures by taking suitable examples
16. Lead-silver system is a two component system. Justify the statement and verify it as simple eutectic.

SECTION D

ANSWER ANY 2 QUESTIONS:EACH CARRIES 5 MARKS

17. (a) Where can you see relaxation effect and electrophoretic effect? What are they?
    (b) Discuss the Debye Huckel theory of strong electrolytes. Give Debye Huckel Onsager equation and explain the terms involved.
18. (a)Expand TGA & DTA.
    (b)Sketch and illustrate the basic instrumentation of UV-Visible spectrophotometry

19. Explain Maxwell distribution of molecular velocity. Give the expressions for rms,average and most probable velocities.
20. (a)Discuss the crystal structure of NaCl.
    (b)Which are the different Bravais lattices of cubic crystals

Pattern of Question paper for U.G Open Courses (Chemistry)-Theory

Reg. No.: Course code:
Name:
---------Semester
Course title..... Programme.....
Total marks: 20
Time: 2 hrs.

Answers can be written only in English

Section A

(very short answer type- Each carries 1 mark -Answer all 5 questions)

1.
2.
3.
4.
5.

Section B

(Short answer type - Each carries 2 mark -Answer 3 questions out of 5)

6.
7.
8.
9.
10.

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

11.
12.
13.
14.
15.

SEMESTER V

Reg. No.: **Course code: 5D01CHE**
Name:

Programme: OPEN COURSE

CHEMISTRY IN SERVICE TO MAN

Total marks: 20 **Time: 2 hrs.**

Answers can be written only in English

Section A

(Each carries 1 mark - Answer all 5 questions)

1. Give the chemical ingredients of talcum powder.
2. Write the composition of natural gas.
3. What are antipyretics?
4. What are silicones?
5. What are the raw materials used in the manufacture of glass?

Section B

(Each carries 2 marks - Answer any 3)

6. What is vulcanization of rubber?
7. What are pheromones?
8. Give the characteristic of good fuel?
9. What is Portland cement?
10. What are tranquillizers?

Section C

(Each carries 3 marks - Answer any 3)

11. Give a brief note on classification of drugs, with examples and uses.
12. Write briefly on different types of cells and batteries.
13. What are pesticides? Discuss the environmental hazards due to them.
14. Give the softening methods of drinking water.
15. Give an account of harmful chemicals in cosmetics.

SEMESTER V **Course code: 5D02CHE**

Name:
Reg No:

Programme: OPEN COURSE

DRUGS – USE & ABUSE

Total marks: 20 **Time: 2 hrs.**

Answers can be written only in English

Section A

(Each carries 1 mark - Answer all 5 questions)

1. Give the definition of pharmaco kinetics.
2. What are inverse agonists?
3. What are Hallucinogens?
4. Give an example for drug acting on central nervous system.
5. What is meant by lethal dose?

Section B

(Each carries 2 marks - Answer any 3)

6. Give an account of treatment in poisoning.
7. Write a note on cardio vascular drugs with examples.
8. What is meant by chemotherapy?
9. Write a short note on enzymes.
10. What are antipyretics and analgesics?

Section C

(Each carries 3 marks - Answer any 3)

11. Give a short note on narcotic drugs and its abuse.
12. What are antibiotics? Give the uses and misuses.
13. Give an account of mode of drug action.
14. Write short note on drugs acting on peripheral nervous system.
15. What are the different types of receptors?

MODEL QUESTION PAPER

V Semester B.A/B.Sc/B.Com/B.B.A Examination

OPEN COURSE IN CHEMISTRY

5D03CHE Environmental Studies (2014 Admn.)

Total Marks: 20

Time: 2Hours

(Answer can be written only in English)

Section A

(Very short answer type-Each carries 1mark-Answer all questions)

1. Mention any three effects of noise pollution on people.
2. What is Photochemical smog?
3. What are Occupational hazards?
4. What is meant by Biomass energy?
5. Name any three harmful chemical used in food.

Section B

(Short answer type-Each carries 2 marks-Answer any 3 out of 5)

6. What is meant by COD? Explain the method of determination.
7. Explain the Soil formation.
8. What are fossil fuels? Mention the limitations in using it.
9. Explain Green House Effect.
10. Explain the cause and sources of Itai-Itai disease.

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

11. Explain the major environmental segments with its special features.
12. What are the important sources of water pollution? Explain the control measures.
13. Write notes on :
    a. Bioaccumulation
    b. Bioinformatics
14. Explain acid rain with its environmental impact.
15. What are the important sources of noise pollution? Explain the harmful effects on human beings.

SEMESTER V

Name:
Reg No: **Programme: OPEN COURSE**

5D04CHE NANOMATERIALS

Total marks: 20
Time: 2 hrs.

Answers can be written only in English

Section A

(Each carries 1 mark - Answer all 5 questions)

1. What are spintonics?
2. What is nanomagnetism?
3. Give one use of nanomaterial in robotics.
4. What are carbon nanotubes?
5. What are quantum dots?

Section B

(Each carries 2 marks - Answer any 3)

6. Discuss the sot gel synthesis of nanoparticles
7. Discuss catalysis using nanomaterials.
8. Give the uses of nanomaterials in computer and mobile electronic devices.
9. Give an account of computational nanotechnology.
10. Give a note on medicinal application of nanomaterials.

Section C

(Each carries 3 marks - Answer any 3)

11. Discuss the photochemical synthesis and electro chemical synthesis of nanomaterials.
12. Give an account on characterization of nanomaterials.
13. Discuss the conductivity and enhanced catalytic activity using nanomaterials compared to macro state particles.
14. Write a note on nanobiotechnology.
15. Explain the use of nanomaterials in solar energy conversion and storage

Pattern of Question paper for Polymer Chemistry-Theory

Reg. No.: Course code:
Name:
---------Semester
Course title..... Programme.....
Total marks: 32
Time: 3hrs.

write only in English

Section A

(very short answer type - Each carries 1 mark -Answer all 5 questions)

1.
2.
3.
4.
5.

Section B

(Short answer type - Each carries 2 mark -Answer 4 questions out of 6)

6.
7.
8.
9.
10.
11.

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

12.
13.
14.
15.
16.

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

17.
18.
19.
20.

MODEL QUESTION PAPER

SEMESTER III

3A11 PCH: POLYMER CHEMISTRY – I

Time : 3 Hrs. Max: Marks 32

SECTION A Answer all Questions: ONE mark each: 5 x 1 = 5

1. Write one eg. Each for addition Polymers and condensation polymers.
2. What are Nomex and Kevlar
3. Write the equation for Weight average molecular mass of polymers
4. What is GPC ?
5. Give one example for Thermo sets and Thermo Plastics

SECTION B : Answer any 4 question: each carry 2 mark : 4 x 2 = 8

6. Write about two eminent scientists and their importance in the area of polymer science.
7. What are LDPE and HDPE Give Examples?
8. Write note on Shellac and Caseins
9. Explain the properties and applications of PET and polycarbonates
10. What are the monomers of Nylon 6.6 and Nylon 6. Write its applications.
11. What are Graft and Block-copolymers?

SECTION C : Answer Any 3 question: 3 marks each: 3x3 = 9

12. Differentiate between Homo polymers and copolymers. with 2 examples Each.
13. Explain the manufacture and applications of polypropylene and polystyrene.
14. What are resins? Write note on Urea formaldehyde and melamine formaldehyde resins.
15. Discuss in detail, the membrane osmometry.
16. Explain the molecular weight distribution in polymers

SECTION D :Answer any 2 question : 5 marks each: 2X5 = 10

17. Discuss the preparation, structure and applications of the following industrially important polymers:
    (1) PVC (2) PPO (3) PAN
18. Explain about cellulose based polymers. What are their commercial applications?
19. Discuss how the following techniques are used for the determination of molecular weight of polymers.
    i) Light scattering method

    ii) Ultra centrifugate technique
20. Explain (a) TGA

    (b) DTA

MODEL QUESTION PAPER

SEMESTER III

3A12 PCH: POLYMER CHEMISTRY – II

Time : 3 Hrs. Max: Marks 32

SECTION A Answer all Questions: ONE mark each: 5x 1 = 5

1. What are the uses of surfactants in emulsion Polymerization?
2. What is mean by living polymers?
3. Define Gel point of a polymer.
4. Why polymerization reactions are usually carried out in N_2 atmosphere
5. What is Ziegler – Natta Catalyst.

SECTION B: Answer any 4 question: each carry 2 mark : 4 x 2 = 8

6. What's Solubility parameter? Explain ?
7. Differentiate between initiators and inhibiters. Give egs:
8. Write Carothers equation, explain the terms. Write the significance.
9. How Rate of polymerization depends on concentration of initiator and monomer in F.R. Polymerization.
10. Write any Two difference between Additional polymerization and condensation polymerization
11. What is mean by kinetic chain length and D.P.

SECTION C : Answer Any 4 question: 3 marks each: 3x3 = 9

12. Give an account of GPC. How it is useful for polymer fractionations
13. Briefly explain F.R Polymerisation.
14. Distinguish between solution polymerization and suspension polymerisation
15. Differentiate between cationic and anionic Polymerisation.
16. Briefly explain Ring scission Polymerisation.

SECTION D :Answer any 2 questin : 5 marks each: 2X5 = 10

17. Discuss in detail.

    (a) Fractional precipitation technique
    (b) Partial dissolution technique

18. (a) Discuss co-ordination Polymerization
    (b) Explain How stereo regularity is imparted in Polymerisation reaction using Ziegler Natta Catalyst.
19. Define the expression for kinetic chain length and DP in FR polymerization
20. What are different techniques of polymerization. Explain any one of the technique.

MODEL QUESTION PAPER

SEMESTER IV

4A13 PCH: POLYMER CHEMISTRY – III

Time : 3 Hrs. Max: Marks 32

SECTION A Answer all Questions: ONE mark each 5 x 1 = 5

1. What is mean by mastication ?
2. What is Hypalon? What is its use ?
3. What are the importance of glass transition temperature ?
4. What are Graham's salt and Kurrol's salt ?
5. What is mean by creaming of rubber latex ?

SECTION B : Answer any 4 question: each carry 2 mark : 4 x 2 = 8

6. Describe the action of plasticizers. Give eg.
7. Write a note on Dilatometric method.
8. Write the preparation and properties of nitrile rubber
9. Differentiate between polyisoprene rubber and butyl rubber
10. What is inorganic benzene ? How is it prepared ?
11. Explain properties of Phosphorous based polymer

SECTION C : Answer Any 3 question: 3 marks each: 3x3 = 9

12. Write a note on Vulcanization
13. Explain the relation between Tg of a polymer and its molecular weight
14. What is meant by reclaimed rubber and foam rubber ? What are their uses ?
15. Discuss the preparation, properties and applications of silicones ?
16. Explain different techniques used in the manufacture of rubber goods from latex.

SECTION D :Answer any 2 question : 5 marks each: 2X5 = 10

17. Write a note on additives used in rubber processing.
18. Explain preparation, properties and structure of boron based polymers.
19. Discuss

    a) Tacticity of polymers

    b) Thermal transition in polymers

20. Give the monomers and structure of

    (1) SBR (2) Poly isoprene

    (3) Butyl rubber (4) Nitrile rubber (5) Gutta – Percha

MODEL QUESTION PAPER

SEMESTER IV

4A14 PCH: POLYMER CHEMISTRY – IV

Time : 3 Hrs. Max: Marks 32

SECTION A Answer all Questions: ONE mark each: 5 x 1 = 5

1. What are the main functions of anti oxidants ?
2. What are the main features of photo degradation ?
3. Give the expansions of

   ASTM, BIS, DIN, ISO
4. What's mean by Pyrolysis of polymers ?
5. What are different types of blends?

SECTION B : Answer any 4 question: each carry 2 mark : 4 x 2 = 8

6. Write a note on fillers
7. Outline the principle and applications of expression molding
8. Discuss briefly about polymer degradation by high energy radiations.
9. Outline the principles of polymer compounding
10. Explain about the composites in the field of defense and aerospace
11. What are stress-strain curves discuss with examples.

SECTION C: Answer Any 3 question: 3 marks each: 3x3 = 9

12. Write short note on casting, spinning and thermoforming
13. Explain about flame retardants, stabilizers and colorants
14. What are different factors affecting thermal stability of a polymer?
15. Discuss the mechanical properties of polymers.
16. What are standards, explain about different organizations of standards of polymers.

SECTION D :Answer any 2 question : 5 marks each: 2X5 = 10

17. Explain composites blends and engineering polymers.
18. Explain about extrusion molding, transfer molding, Rotational molding and compression molding.
19. Discuss in detail:

    (a) Thermal degradations
    (b) Oxidative degradation
20. Discuss about different mechanical properties of polymers.