



Department of M.Sc. Integrated Chemistry
Palamuru University
Minutes of BoS Meeting

The meeting with all the members of Board of studies was held on the 13th day of January 2025 at 3-5 PM through Zoom virtual meeting mode to finalise the total syllabi for the academic year 2024-25

The meeting was held with following members

SN	Name	Designation
1	Dr. N. Chandra Kiran , Associate Professor, Dept. of Chemistry, PU, MBNR	Chairperson
2	Dr. K. Rajender Reddy , Chief Scientist, IICT, Hyderabad	Member
3	Prof. C. Malla Reddy , Dept. of Chemistry, IIT, Hyderabad	Member
4	Dr. M. Sridhar Reddy , Senior Principal Scientist, IICT, Hyderabad	Member
5	Dr. Md. Noorjahan , Associate Professor, Dept. of Chemistry, PU, MBNR	Member
6	Dr. B. Satynarayana , Associate Professor, Dept. of Chemistry, JNTU, Hyderabad	Member
7	Dr. M. Narsingam , Sr. Scientist, Heterodrugs Pvt Limited, Balnagar, Hyd.	Member
8	Dr. S. Vijaya Laxmi , Assistant Professor, Dept. of Chemistry, PU, MBNR	Member
9	Ms. Afreen Saleha , Lecturer, TTWRDC, Jedcherla, MBNR	Member
10	Head , Dept. of Integrated Chemistry, Palamuru University, MBNR	Member

During the meeting the members suggested various important inputs to further improve the syllabi. After the meeting following resolutions were made and are unanimously approved.

1. New syllabi is framed, which was approved by all BoS members, from the academic year 2024-25.
2. Seminar presentations are considered as workload, and accordingly workload is distributed among the faculty.
3. Allotment of department faculty, who has the essential qualifications to become a research supervisor (with a PhD degree and 02 publications post PhD), to supervise the X-sem students of the department for their project dissertations only. Two students are allotted for each faculty.
4. As per the suggestions made by BoS members, some of the modifications in syllabus are made and are incorporated in Annexure-I.
5. The proposed syllabi, with modifications, is unanimously approved by the members

Kiran

Dr N Chandra Kiran
(BoS Chairperson)

KRReddy

(Dr K. Rajender Reddy)

C. Malla Reddy

(Prof. C. Malla Reddy)

M. Sridhar Reddy

(Dr. M. Sridhar Reddy)

Noorjahan

(Dr Md. Noorjahan)

B. Satyanarayana

(Dr. B. Satyanarayana)

M. Narsingam

(Dr. M. Narsingam)

S. Vijaya Laxmi

(Dr. S. Vijaya Laxmi)

Afreen Saleha

(Ms. Afreen Saleha)

Head

Head, Dept. of. Integrated
Chemistry

On

Suggestions and Modifications done:

SN	Suggestion Made by members	Modification
1	Syllabus pattern should be uniform to all papers	It is made uniform to all the papers
2	To delete AECC course from syllabus	It is deleted from the syllabus
3	To include different salts to be analysed qualitatively in the practicum paper	They are included in the syllabus.
4	To include supramolecular synthons in 9 th semester	It is included in the syllabus

Kiraneha
mbeigam

Apy Nossin
M.Git

Kready Alex Salda.

PW

PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
CBCS with effect from Academic year 2024-25 onwards
Semester I

Course Type	Courses & Course codes	Hours per week	Duration of Exam Hours	Marks			No. of Credits
				Internal	External	Total	
FC	General English (1-T1)	4	2.5	10	40	50	4
	Telugu (1-T2)	4	2.5	10	40	50	4
CC Theory	Mathematics-I/ Biology -I (1-T3A/1-T3B)	4	2.5	10	40	50	4
	Mathematics-II/ Biology -II (1-T4A/1-T4B)	4	2.5	10	40	50	4
	Computer Science (1-T5)	4	2.5	10	40	50	4
	Physics (1-T6)	4	2.5	10	40	50	4
	Chemistry (1-T7)	4	2.5	10	40	50	4
CC Practical	Mathematics/ Biology (1-P1A/1-P1B)	2	4	10	40	50	1
	Physics (1-P2)	2	4	10	40	50	1
	Chemistry (1-P3)	2	4	10	40	50	1
Total		34				500	31

FC: Foundation Course, SEC: Skill Enhancement Course, CC: Core Course

PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester II

Course Type	Courses & Course codes	Hours per week	Duration of Exam Hours	Marks			No. of Credits
				Internal	External	Total	
FC	English (2-T1)	4	2.5	10	40	50	4
	Telugu (2-T2)	4	2.5	10	40	50	4
CC Theory	Mathematics/Biology (2-T3A/2-T3B)	4	2.5	10	40	50	4
	Computer Science (2-T4)	4	2.5	10	40	50	4
	Physics (2-T5)	4	2.5	10	40	50	4
	Chemistry (2-T6)	4	2.5	10	40	50	4
CC Practical	Mathematics/ Biology (2-P1A/2-P1B)	2	4	10	40	50	1
	Computer Science (2-P2)	2	4	10	40	50	1
	Physics (2-P3)	2	4	10	40	50	1
	Chemistry (2-P4)	2	4	10	40	50	1
Total		32				500	28

FC: Foundation Course, SEC: Skill Enhancement Course, CC: Core Course

Kirankumar *APY* *Abhishek* *Chandrababu* *Shamshad*
mbhargava M. Srik *K.P. Reddy* *Aluru Sateja*
PKW

PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester III

Course Type	Courses & Course codes	Hours per week	Duration of Exam Hours	Marks			No. of Credits
				Internal	External	Total	
FC	English (3-T1)	4	2.5	10	40	50	4
	Telugu (3-T2)	4	2.5	10	40	50	4
CC Theory	Mathematics/Biology (3-T3A/3-T3B)	4	2.5	10	40	50	4
	Computer Science (3-T4)	4	2.5	10	40	50	4
	Physics (3-T5)	4	2.5	10	40	50	4
	Chemistry (3-T6)	4	2.5	10	40	50	4
	Mathematics/ Biology (3-P1A/3-P1B)	2	4	10	40	50	1
CC Practical	Computer Science (3-P2)	2	4	10	40	50	1
	Physics (3-P3)	2	4	10	40	50	1
	Chemistry (3-P4)	2	4	10	40	50	1
	Total	32				500	28

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PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester IV

Course Type	Courses & Course codes	Hours per week	Duration of Exam Hours	Marks			No. of Credits
				Internal	External	Total	
FC	English (4-T1)	4	2.5	10	40	50	4
	Telugu (4-T2)	4	2.5	10	40	50	4
CC Theory	Mathematics/Biology (4-T3A/4-T3B)	4	2.5	10	40	50	4
	Computer Science (4-T4)	4	2.5	10	40	50	4
	Physics (4-T5)	4	2.5	10	40	50	4
	Chemistry (4-T6)	4	2.5	10	40	50	4
	Mathematics/ Biology (4-P1A/4-P1B)	2	4	10	40	50	1
CC Practical	Computer Science (4-P2)	2	4	10	40	50	1
	Physics (4-P3)	2	4	10	40	50	1
	Chemistry (4-P4)	2	4	10	40	50	1
	Total	32				500	28

FC: Foundation Course, SEC: Skill Enhancement Course, CC: Core Course

Kiranes
APU
N. G. G.
K. R. Reddy
Abhishek
PSW

PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester V

Course Type	Courses	Hours per week	Duration of Exam Hrs.	Marks			No. of Credits
				Internal	External	Total	
SEC	Statistics (5-T1)	3	2.5	10	50	60	3
CC Theory	General Chemistry -1 (5-T2)	3	2.5	10	50	60	3
	Inorganic Chemistry -1 (5-T3)	3	2.5	10	50	60	3
	Organic Chemistry -1 (5-T4)	3	2.5	10	50	60	3
	Physical Chemistry -1 (5-T5)	3	2.5	10	50	60	3
CC Practical s	Inorganic Chemistry -1 (5-P1)	4	4	10	40	50	2
	Organic Chemistry -1 (5-P2)	4	4	10	40	50	2
	Physical Chemistry -1 (5-P3)	4	4	10	40	50	2
	General Chemistry-1 (5-P4)	4	4	10	40	50	2
	Seminar	2	6	-	50	50	1
Total		33				550	24

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PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester VI

Course Type	Courses	Hours per week	Duration of Exam Hrs.	Marks			No. of Credits
				Internal	External	Total	
SEC	Pharmacology (6-T1)	3	2.5	10	50	60	3
CC Theory	General Chemistry -2 (6-T2)	3	2.5	10	50	60	3
	Inorganic Chemistry -2 (6-T3)	3	2.5	10	50	60	3
	Organic Chemistry -2 (6-T4)	3	2.5	10	50	60	3
	Physical Chemistry -2 (6-T5)	3	2.5	10	50	60	3
CC Practical s	Inorganic Chemistry -2 (6-P1)	4	4	10	40	50	2
	Organic Chemistry -2 (6-P2)	4	4	10	40	50	2
	Physical Chemistry -2 (6-P3)	4	4	10	40	50	2
	General Chemistry-2 (6-P4)	4	4	10	40	50	2
	Seminar	2	6	-	50	50	1
Total		33				550	24

FC: Foundation Course, SEC: Skill Enhancement Course, CC: Core Course

Kirankumar
apj
Allojinh
Shayam
K.P. Reddy
Abhishek
Mr. Gith
Prasanna

PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester VII

Course Type	Courses	Hours per week	Duration of Exam Hrs.	Marks			No. of Credits
				Internal	External	Total	
CC Theory	General Chemistry -3 (7-T1)	4	3	15	60	75	4
	Inorganic Chemistry -3 (7-T2)	4	3	15	60	75	4
	Organic Chemistry -3 (7-T3)	4	3	15	60	75	4
	Physical Chemistry -3 (7-T4)	4	3	15	60	75	4
CC Practical s	Inorganic Chemistry -3 (7-P1)	4	4	10	40	50	2
	Organic Chemistry -3 (7-P2)	4	4	10	40	50	2
	Physical Chemistry -3 (7-P3)	4	4	10	40	50	2
	General Chemistry-3 (7-P4)	4	4	10	40	50	2
	Seminar	2	6	-	50	50	1
	Total	34				550	25

FC: Foundation Course, SEC: Skill Enhancement Course, CC: Core Course

PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester VIII

Course Type	Courses	Hours per week	Duration of Exam Hrs.	Marks			No. of Credits
				Internal	External	Total	
CC Theory	General Chemistry -4 (8-T1)	4	3	15	60	75	4
	Inorganic Chemistry -4 (8-T2)	4	3	15	60	75	4
	Organic Chemistry -4 (8-T3)	4	3	15	60	75	4
	Physical Chemistry -4 (8-T4)	4	3	15	60	75	4
CC Practical s	Inorganic Chemistry -4 (8-P1)	4	4	10	40	50	2
	Organic Chemistry -4 (8-P2)	4	4	10	40	50	2
	Physical Chemistry -4 (8-P3)	4	4	10	40	50	2
	General Chemistry-4 (8-P4)	4	4	10	40	50	2
	Seminar	2	6	-	50	50	1
	Total	34				550	25

FC: Foundation Course, SEC: Skill Enhancement Course, CC: Core Course

Kiranchan
APR
M. S. V.
K. R. Reddy
Abhishek
Prashant

PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester IX

Course Type	Courses	Hours per week	Duration of Exam Hrs.	Marks			No. of Credits
				Internal	External	Total	
CC Theory	Inorganic Chemistry -5 (9-T1)	4	3	15	60	75	4
	Inorganic Chemistry -6 (9-T2)	4	3	15	60	75	4
	Organic Chemistry -5 (9-T3)	4	3	15	60	75	4
	Physical Chemistry -5 (9-T4)	4	3	15	60	75	4
CC Practical s	Inorganic Chemistry -5 (9-P1)	4	4	10	40	50	2
	Organic Chemistry -5 (9-P2)	4	4	10	40	50	2
	Physical Chemistry -5 (9-P3)	4	4	10	40	50	2
	General Chemistry-5 (9-P4)	4	4	10	40	50	2
	Seminar	2	6	-	50	50	1
	Total	34				550	25

CC: Core Course
PALAMURU UNIVERSITY
M.Sc. Integrated Course in Chemistry
Semester X

Course Type	Courses	Hours per week	Duration of Exam Hrs.	Marks			No. of Credits
				Internal	External	Total	
CC Theory	Polymer Chemistry (10-T1)	4	3	15	60	75	4
	Medicinal Chemistry (10-T2)	4	3	15	60	75	4
Project	Project work	18	6	-	200	200	9
	Seminar	2	6	-	50	50	1
	Total	28				400	18

CC: Core Course

Kiran
 Dr. N. Chandra Kiran
 (BoS Chairperson)

C. Malla Reddy
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MD. Noorjahan
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 (Dr. M. Narsingam)

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S. Vijaya Laxmi
 (Dr. S. Vijaya Laxmi)

Afreen Saleha
 (Ms. Afreen Saleha)

P. V. V.
 (Head, Dept. of M.Sc. Integrated Chemistry)

DEPARTMENT OF M.Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-T1	Number of Credits- 04
Title of the Course: General English	Total Instruction Hours- 60 per semester

Unit I

12 h

SHORT FICTION: "The Curb in the Sky" by James Thurber—**PRONUNCIATION:** consonant sounds— **GRAMMAR:** noun—**VOCABULARY:** roots, prefix and suffix—**SPELLING:** wrong spellings—**PUNCTUATION:** capitalization— **CONVERSATION:** introducing oneself informal /social contexts—**READING:** biography of Chindula Yelamma, a Telangana Artisan— **WRITING:** guided writing & expansion —**SOFT SKILLS:** motivation and goal setting— **VALUES:** "Well begun is half done"

Unit II

12 h

PROSE: "Happy People" by W.R. Inge— **PRONUNCIATION:** vowels-monophthongs— **GRAMMAR:** pronoun—**VOCABULARY:** roots, prefix & suffix— **SPELLING:** 'un' and 'dis' for antonyms— **PUNCTUATION:** capitalization— **CONVERSATION:** starting & controlling a conversation—**READING:** Million March—An Initiative for Statehood— **WRITING:** sequencing— **SOFT SKILLS:** self-confidence— **VALUES:** "Doubt is the beginning of wisdom"

Unit III

12 h

POETRY: "A Psalm of Life" by Henry Wadsworth Longfellow— **PRONUNCIATION:** vowels diphthongs—**GRAMMAR:** auxiliary verbs— **VOCABULARY:** homonyms, homographs, homophones— **SPELLING:** words ending 'tion' or 'sion'— **PUNCTUATION:** full stop and comma— **CONVERSATION:** describing your college and course of study—**READING:** Batukamma: Telangana's Cultural Identity— **WRITING:** paragraph, descriptive writing—**SOFT SKILLS:** non-verbal communication/body language— **VALUES:** "Actions speak louder than words"

Unit IV

12 h

DRAMA: "The Dear Departed" (an extract) by Stanley Houghton— **PRONUNCIATION:** varied pronunciations of the same letter— **GRAMMAR:** main verbs and tenses— **VOCABULARY:** collocation— **SPELLING:** words ending 'tion' or 'ment'— **PUNCTUATION:** question and exclamation marks— **CONVERSATION:** leaving a message on the answering machine, making an appointment on telephone— **READING:** Husain Sagar Lake: A Well-known Tourist Attraction— **WRITING:** dialogue writing— **SOFT SKILLS:** inter personal skills— **VALUES:** "Faith will move mountains"

Unit V

12 h

Language & Soft Skills Lab: Pronunciation, Conversation, Reading, Soft Skills and Values

Prescribed General English Text Book for I Year (Sem-I & Sem-II) Title: *English Made Easy* published by Orient Blackswan

Editors: Prof. E. Suresh Kumar, Prof. Sumita Roy and Prof. A. Karunaker

Kirankumar
APV
Moogab
K. K. Reddy
Amr Patla
Shayam
M. G. N.
P. R.
mbn

DEPARTMENT OF M.Sc. M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-I

Course Code: 1-T2	Number of Credits- 04
Title of the Course :Telugu	Total Instruction hours - 60 per Semester

ప్రాచీన పద్యభాగం 15 h

1. శకుంతలోపాఖ్యానం
2. గౌడగూచి
3. త్యాగనిరతి

ఆధునిక కవిత్వం 15 h

1. కాసులు
2. రాజు - కవి
3. గంగిరెద్దు
4. జయభేరి

ఉపవాచకం 15 h

రుద్రమదేవి (నవల)

భాషా విభాగం 15 h

భాషాభాగాలు, సాధుశబ్దాల గుర్తింపు
పర్యాయ పదాలు, నానార్థాలు

పాఠ్యగ్రంథం తెలుగు అకాడమీ ప్రచురించిన 'సాహితీ మండీర'. దీనిలో రెండు పాఠాలు (సంవరణుని తపస్సు, శ్రీరంగక్షేత్ర మహిమ) ఉస్మానియా విశ్వవిద్యాలయ పరిధిలోని డిగ్రీ ద్వితీయభాష (తెలుగు) విద్యార్థులకు తొలగించి, వాటిని మోడర్న్ లాంగ్వేజ్ (తెలుగు) విద్యార్థులకు నిర్దేశించనైనది.

References: Telugu Academy Books.

Kiranchas *aby* *Moosgil* *Cherally* *Shayagan*
mlougan *M. Giller* *K.R. Reddy* *Ahmed Salih*
RW

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-T3A	Number of Credits- 04
Title of the Course: Mathematics-I for M. P.C students	Total Instruction hours - 60 per Semester

DIFFERENTIAL CALCULUS

Objective: The course is aimed at exposing the students to some basic notions in differential calculus.

Outcome: By the time students complete the course they realize wide ranging applications of the subject.

Unit- I **15 h**

Successive differentiation- Expansions of Functions- Mean value theorems

Unit – II **15 h**

Indeterminate forms – Curvature and Evolutes

Unit – III **15 h**

Partial differentiation – Homogeneous functions- Total derivative

Unit – IV **15 h**

Maxima and Minima of functions of two variables – Lagrange's Method of multipliers – Asymptotes- Envelopes

Text: Shanti Narayan and Mittal, Differential Calculus

References: 1. William Anthony Granville, Percy F Smith and William Raymond Longley; Elements of the differential and integral calculus

2. Joseph Edwards, Differential calculus for beginners

3. Smith and Minton, Calculus

4. Elis Pine, How to Enjoy Calculus

5. HariKishan, Differential Calculus

Kirankumar *apf* *Allojinh* *Shanayam*
mbairam *M. Gith* *K.R. Reddy* *Abas Balha*
PKR

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-I

Course Code: 1-T3B	Number of Credits- 04
Title of the Course: Biology-I for Bi. P. C students	Total Instruction hours - 60 per Semester

Unit-I

15 h

General characters and brief life history of one representative each of

- a) Prokaryotes: Viruses, Cyanobacteria, Bacteria
- b) Eukaryotes: Algae, Fungi, Bryophytes, Pteridophytes, Cycadophyta (Gymnosperms) and Magnoliophyta (Angiosperms)

Unit-II

15 h

Brief account of taxonomy and economic botany of Magnoliophyta

- a) Magnoliopsida (Dicotyledons): Fabaceae, Cucurbitaceae, Apiaceae and Solanaceae
- b) Lillioopsida (Monocotyledons): Liliaceae and Poaceae

Unit-III

15 h

Plants and mineral nutrition:

Essential mineral, macro and micronutrients. Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation Photosynthesis Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

Unit-IV:

15 h

Plant respiration:

Respiration, glycolysis, fermentation (anaerobic), Introduction to plant growth regulators, Cell - The unit of life Structure and functions of cell and cell organelles. Cell division: Mitosis and Meiosis and their significance

Reference Books

1. Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
2. Pandey, B. P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company Ltd, New Delhi.
3. Vashishta, B. R., A. K. Sinha and V. P. Singh. 2008. Botany for Degree Students: Algae. S. Chand & Company Ltd, New Delhi.
4. Vashishta, B. R. 1990. Botany for Degree Students: Fungi, S. Chand & Company Ltd, New Delhi.
5. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.
6. Text book of Biology by S. B. Gokhale
7. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram. Reference Books
8. A Text book of Biology by B.V. Sreenivasa Naidu B
9. A Text book of Biology by Naidu and Murthy c. Botany for Degree students By A.C.Dutta.

Kiraneetha *apuj* *Naragula* *Chellu* *Shamanna*
m. l. s. g. m *m. h. v.* *K. R. Reddy* *Aluru* *Satcha*
*SPW*₄

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-T4A	Number of Credits- 04
Title of the Course :Mathematics-II for M. P. C students	Total Instruction hours - 60 per Semester

DIFFERENTIAL EQUATIONS

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcomes: After learning the course the students will be equipped with the various tools to solve few types' differential equations that arise in several branches of science.

Unit – I

15 h

Differential Equations of first order and first degree: Exact differential equations – Integrating Factors – Change in variables – Total Differential Equations – Simultaneous Total Differential Equations – Equations of the form $dx/P = dy/Q = dz/R$
 Differential Equations first order but not of first degree: Equations Solvable for y – Equations Solvable for x – Equations that do not contain x (ory) – Clairaut's equation

Unit – II

15 h

Higher order linear differential equations: Solution of homogeneous linear differential equations with constant coefficients – Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = bx^n, e^{ax}, e^{iax}, b \cos ax, b \sin(ax)$

Unit – III

15 h

Method of undetermined coefficients – Method of variation of parameters – Linear differential equations with non-constant coefficients – The Cauchy – Euler Equation

Unit – IV

15 h

Partial Differential equations- Formation and solution- Equations easily integrable – Linear equations of first order – Non linear equations of first order – Charpit's method– Non homogeneous linear partial differential equations – Separation of variables

Text: Zafar Ahsan, Differential Equations and Their Applications

References: 1. Frank Ayres Jr, Theory and Problems of Differential Equations Ford, L.R, Differential Equations.

2. Daniel Murray, Differential Equations

3. S. Balachandra Rao, Differential Equations with Applications and Programs

4. Stuart P Hastings, J Bryce McLead; Classical Methods in Ordinary Differential Equations

Kiranehan
APY
Nosy
5
Chandru
KP Reddy
Shamayan
Abhishek
Palcha

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-T4B	Number of Credits- 04
Title of the Course : Biology-II	Total Instruction hours - 60 per Semester

Unit-I:

15 h

1. Principles of taxonomy, general characters and classification of major invertebrate phylum (up to classes)
2. Evolution of animal body plan (body symmetry, coelom and segmentation)
3. Animal associations: symbiosis, commensalisms and parasitism. Life cycles of plasmodium and wuchereria.

Unit-II:

15 h

1. Useful and harmful insects (Lac insect, silkworm, honey bee, vectors of diseases: house fly and mosquito)
2. Identification of poisonous and non-poisonous snakes.

Unit-III:

15 h

1. General Characters and classification of chordate up to orders
2. Rabbit: Morphology, digestive system, circulatory system, respiratory system, nervous system, excretory system, reproductive system and life cycle.

Unit-IV:

15 h

Histology and function of the following:

Liver, Pancreas, Kidney, Testis, Ovary, Stomach, Intestine, Endocrine glands and their functions.

Reference Books:

1. A Text book of Ivertebrates by N Arumugam ,M G Ragunathan, T Murugan and B Ramanathan
2. Invertebrate Zoology by E L Jordan and Dr. P S Verma
3. Invertebrata by Dr. N Arumugam, Dr. S Kannan, Dr. M G Raghunathan
4. The Insects : Beneficial and harmful aspects by Dunston and P Ambrose
5. Management of beneficial insects by P K Choudhary
6. Indian snakes by Neelim Kumar Khaire
7. Chordate Zoology by E L Jordan and Dr. P S Verma
8. A Text book of Chordates by Dr. A Thangamani, Dr. S Prasanna Kumar, Dr. L M Narayana
9. A Text book of Zoology Chordate by B D Singh
10. Mammalian Histology by Dr. Kishore, R Pawar, Dr. Ashok, E Desai
11. Textbook of Histology by Leslie P Gartner.

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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-T5	Number of Credits- 04
Title of the Course: Computer Science	Total Instruction hours - 60 per Semester

Unit-I: 12 h
 Introduction to personal computers- Processing information- Inside the PC- storing information: Disks, Discs and Flash – Getting information in: Input- Getting Information Out: Output- Windows and File Management- Working with Windows- Working with Files. (Chapters 1,2,3,4,5,6 of Text book 1)

Unit-II: 12 h
 MS-Word: Basics- Formatting text and Documents- Headers Footers and Foot Notes- Tabs, Tables and sorting- working with graphics- Templates, wizards and sample documents- macros- mail merge.
 (Chapters 4,5,6,7,8,9,10,11,12 of Text book 2)

Unit-III: 12 h
 MS Excel: Basics- Spreadsheet Features- Entering and formationg text and numbers- Copying, moving, auto fill- Entering and editing formulas- Rearranging worksheets- Excel Formatting Techniques- page setup- column width, row height- alignment- borders- colors and shading- page breaks- charts and graphics.
 (Chapters 13,14,15,17,18,19 of Text book 2)

Unit-IV: 12 h
 MS-Powerpoint: Basics- Creating presentations- working with Text-Graphics and Multimedia setting up the slide show.
 (Chapters 24,25,26,27 of Text book 2)

Unit-V: 12 h
 MS Access: Introduction- Creating a database and tables- adding, renaming deleting fields in tables- primary key-forms- Entering and Editing data in Tables- Finding, sorting and Displaying Data- Printing reports, Forms, Letters and Lables.
 (Chapters 29,30,31,32,33,34 of Text book 2)

Text books:

1. Computer Fundamentals, Lary Long, Wiley India.
2. Working in Micro Soft Office, Ron Mansfield, TMH.

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 Kiran... (green), Apy... (blue), Moog... (blue), Suresh... (blue), Shamp... (green),
 m... (blue), M. G... (blue), K. Reddy... (blue), Alex Balcha... (blue),
 P... (blue)

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-T6	Number of Credits- 04
Title of the Course : Physics	Total Instruction hours - 60 per Semester

Mechanics

Unit – I

15 h

Vector Analysis

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Greens theorems- simple applications.

Unit – II

15 h

Mechanics of Particles

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section,

Mechanics of rigid bodies

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope.

Unit – III

15 h

Central Forces

Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

Unit – IV

15 h

Special theory of relativity

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

NOTE: Problems should be solved at the end of every chapter of all units.

Textbooks

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - Tata-McGraw hill Company Edition 2008.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker Wiley India Edition 2007.
3. **First Year Physics - Telugu Academy**.
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. McGraw Hill.

Reference Books

1. **Fundamentals of Physics** by Alan Giambattista et al Tata-McGraw Hill Company Edition, 2008.
2. **University Physics** by Young and Freeman, Pearson Education, Edition 2005.
3. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman

Handwritten signatures and initials: Kiranek, apy, Norzgal, Suleedy, Shanyan, m-lin, K.R. Reddy, Ameen Salih, P.W.

Pearson Education Eleventh Edition.

4. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies.*
5. **Mechanics.** Hans & Puri. *TMH Publications.*
6. **Engineering Physics.** R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications.*
7. R. P. Feynman, R B Lighton and M Sands - The Feynman Lectures in Physics, Vol.-1, BI Publications,
8. J. C. Upadhyay - Mechanics.
9. P. K. Srivastava - Mechanics, New Age International.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-T7	Number of Credits- 04
Title of the Course : Chemistry	Total Instruction hours - 60 per Semester

Inorganic Chemistry

Unit-I: Periodic Properties of elements and chemistry of s-block elements

10 h

a) Periodic properties of elements

Ionization energy, electron affinity and electronegativity of elements, methods of determination of electronegativity- Pauling's approach and Mulliken's approach, Applications of electronegativity with respect to chemical behavior nature of bond, bond length, bond angle and diagonal relationship.

b) Chemistry of S-block elements

Electropositive character, reducing properties, oxidation potentials, flame coloration of alkali and alkaline earth metals, solutions of S-block metals in liquid NH_3 , uses of alkali and alkaline earth metals.

Unit-II: Theory of quantitative analysis and evaluation of analytical data
Theory of quantitative analysis

10 h

- 1) I) Volumetric analysis- Principles Types of titrations-1) Acid- base titrations- strong acid-strong base, strong acid – weak base, weak acid -strong base, weak acid—weak base -Principles, titration curves and theory of acid base indicators

II) Redox titration -principles and theory of redox indicators

III) Complex titrations- principles and theory of metal ion indicators

- 2) Gravimetric analysis principles and applications: co-precipitation and post precipitation

Evaluation of analytical data

Accuracy, precision and Errors- Absolute error and relative error, classification of errors- determinate and indeterminate error, minimization of errors, significant figures

Organic Chemistry

Unit-III: Benzene and its reactivity

10 h

Molecular formula of Benzene, Structure of Benzene-open chain structure not possible, proposition of cyclic structure by Kekule, dynamic equilibrium, evidence based on Ozonolysis experiment, concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene-Concept of aromaticity- definition, Huckel's rule-application to Benzenoid (Benzene, Naphthalene and

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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-P1A	Number of Credits- 01
Title of the Course: Maths Practical	Total Instruction hours - 30 per Semester

UNIT-I

1. If $u = \tan^{-1} x$, prove that

$$(1+x^2) \frac{d^2 u}{dx^2} + 2x \frac{du}{dx} = 0$$

and hence determine the values of the derivatives of u when $x=0$

2. If

$$y = \sin(m \sin^{-1} x), \text{ show that}$$

$$(1-x^2)y_{n+2} = (2n+1)xy_{n+1} + (n^2-m^2)y_n$$

and find $y_n(0)$.

3. If U_n denotes the n th derivative of $(Lx+M)/(x^2-2Bx+C)$, prove

$$\frac{x^2-2Bx+C}{(n+1)(n+2)} U_{n+2} + \frac{2(x-B)}{n+1} U_{n+1} + U_n = 0.$$

4. If $y = x^2 e^x$, then

$$\frac{d^n y}{dx^n} = \frac{1}{2} n(n-1) \frac{d^2 y}{dx^2} - n(n-2) \frac{dy}{dx} + \frac{1}{2} (n-1)(n-2) y.$$

5. Determine the intervals in which the function

$$(x^4 + 6x^3 + 17x^2 + 32x + 32)e^{-x}$$

is increasing or decreasing.

6. Separate the intervals in which the function

$$(x^3 + x + 1)/(x^2 - x + 1)$$

is increasing or decreasing.

7. Show that if $x > 0$,

$$(i) \quad x - \frac{x^2}{2} < \log(1+x) < x - \frac{x^2}{2(1+x)}$$

$$(ii) \quad x - \frac{x^2}{2} + \frac{x^3}{3(1+x)} < \log(1+x) < x - \frac{x^2}{2} + \frac{x^3}{3}$$

8. Prove that

$$e^{ax} \sin bx = bx + abx^2 + \frac{3a^2b - b^3}{3!} x^3 + \dots$$

$$+ \frac{(a^2 + b^2)^{\frac{1}{2}n}}{n!} x^n \sin\left(n \tan^{-1} \frac{b}{a}\right) + \dots$$

9. Show that $\cos^2 x = 1 - x^2 + \frac{1}{3}x^4 - \frac{1}{45}x^6 + \dots$

10. Show that

$$e^{m \tan^{-1} x} = 1 + mx + \frac{m^2}{2!} x^2 + \frac{m(m^2-2)}{3!} x^3 + \frac{m^2(m^2-8)}{4!} x^4 + \dots$$

UNIT-II

1. Find the radius of curvature at any point on the curves

(i) $y = c \cosh(x/c)$ (Catenary).

(ii) $x = a(\cos t + t \sin t)$, $y = a(\sin t - t \cos t)$.

(iii) $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$. (Astroid)

(iv) $x = (a \cos t)/t$, $y = (a \sin t)/t$.

2. Show that for the curve

$$x = a \cos \theta (1 + \sin \theta), y = a \sin \theta (1 + \cos \theta),$$

the radius of curvature is, a , at the point for which the value of the parameter is $-\pi/4$.

3. Prove that the radius of curvature at the point

$$(-2a, 2a) \text{ on the curve } x^2 y = a(x^2 + y^2) \text{ is, } -2a.$$

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4. Show that the radii of curvature of the curve
 $x = ae^{\theta} (\sin \theta - \cos \theta), y = ae^{\theta} (\sin \theta + \cos \theta)$,
 and its evolute at corresponding points are equal.

5. Show that the whole length of the evolute of the ellipse
 $x^2/a^2 + y^2/b^2 = 1$
 is $4(a^2/b - b^2/a)$.

6. Show that the whole length of the evolute of the astroid
 $x = a \cos^3 \theta, y = a \sin^3 \theta$
 is $12a$.

7. Evaluate the following :

(i) $\lim_{x \rightarrow 0} \frac{xe^x - \log(1+x)}{x^2}$ (D.U. 1952) (ii) $\lim_{x \rightarrow 0} \frac{x \cos x - \log(1+x)}{x^3}$
 (D. U. Hons. 1951, P.U. 1957)

(iii) $\lim_{x \rightarrow 0} \frac{e^x \sin x - x - x^2}{x^2 + x \log(1-x)}$ (D.U. 1953) (iv) $\lim_{x \rightarrow 0} \left\{ \frac{1}{x} - \frac{1}{x^2} \log(1+x) \right\}$.
 (D.U. 1955)

8. If the limit of

$$\frac{\sin 2x + a \sin x}{x^3},$$

as x tends to zero, be finite, find the value of a and the limit.

9. Determine the limits of the following functions :

(i) $x \log \tan x, (x \rightarrow 0)$. (ii) $x \tan(\pi/2 - x), (x \rightarrow 0)$.
 (iii) $(a-x) \tan(\pi x/2a), (x \rightarrow 0)$.

10. Determine the limits of the following functions :

i. $\frac{e^x - e^{-x} - x}{x^2 \sin x}, (x \rightarrow 0)$. ii. $\frac{\log x}{x^2}, (x \rightarrow \infty)$.

iii. $\frac{1+x \cos x - \cosh x - \log(1+x)}{\tan x - x}, (x \rightarrow 0)$.

iv. $\frac{\log(1+x) \log(1-x) - \log(1-x^2)}{x^4}, (x \rightarrow 0)$.

UNIT-III

1. If $z = xy f(x/y)$, show that

$$x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 2z.$$

2. If $z(x+y) = x^2 + y^2$, show that

$$\left(\frac{\partial z}{\partial x} - \frac{\partial z}{\partial y} \right)^2 = 4 \left(1 - \frac{\partial z}{\partial x} - \frac{\partial z}{\partial y} \right).$$

3. If $z = 3xy - y^3 + (y^2 - 2x)^{3/2}$, verify that

$$\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x} \text{ and } \frac{\partial^2 z}{\partial x^2} \frac{\partial^2 z}{\partial y^2} = \left(\frac{\partial^2 z}{\partial x \partial y} \right)^2.$$

4. If $z = f(x+ay) + \phi(x-ay)$, prove that

$$\frac{\partial^2 z}{\partial y^2} = a^2 \frac{\partial^2 z}{\partial x^2}.$$

5. If $u = \tan^{-1} \frac{x^2 + y^2}{x-y}$, find

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}.$$

6. If $f(x, y) = 0, \phi(y, z) = 0$, show that

$$\frac{\partial f}{\partial y} \cdot \frac{\partial \phi}{\partial z} \cdot \frac{dz}{dx} = \frac{\partial f}{\partial x} \cdot \frac{\partial \phi}{\partial y}.$$

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7. If $x\sqrt{1-y^2} + y\sqrt{1-x^2} = a$, show that

$$\frac{d^2y}{dx^2} = \frac{a}{(1-x^2)^{\frac{3}{2}}}$$

8. Given that

$$f(x, y) \equiv x^3 + y^3 - 3axy = 0, \text{ show that}$$

$$\frac{d^2y}{dx^2} \cdot \frac{d^2x}{dy^2} = \frac{4a^3}{xy(xy-2a^2)^2}$$

9. If u and v are functions of x and y defined by

$$x = u + e^{-v} \sin u, \quad y = v + e^{-v} \cos u,$$

prove that

$$\frac{\partial u}{\partial y} = \frac{\partial v}{\partial x}$$

10. If $H = f(y-z, z-x, x-y)$; prove that,

$$\frac{\partial H}{\partial x} + \frac{\partial H}{\partial y} - \frac{\partial H}{\partial z} = 0.$$

UNIT-IV

1. Find the minimum value of $x^2 + y^2 + z^2$ when

(i) $x + y + z = 3a$.

(ii) $xy + yz + zx = 3a^2$.

(iii) $xyz = a^3$.

2. Find the extreme value of xy when

$$x^2 + xy + y^2 = a^2.$$

3. In a plane triangle, find the maximum value of

$$\cos A \cos B \cos C.$$

4. Find the envelope of the family of semi-cubical parabolas

$$y^2 - (x+a)^3 = 0.$$

5. Find the envelope of the family of ellipses

$$x^2/a^2 + y^2/b^2 = 1,$$

where the two parameter a, b , are connected by the relation

$$a + b = c;$$

c , being a constant.

6. Show that the envelope of a circle whose centre lies on the parabola $y^2 = 4ax$ and which passes through its vertex is the cissoid

$$y^2(2a+x) + x^3 = 0.$$

7. Find the envelope of the family of straight lines $x/a + y/b = 1$ where a, b are connected by the relation

(i) $a + b = c$.

(ii) $a^2 + b^2 = c^2$.

(iii) $ab = c^2$,

c is a constant.

8. Find the asymptotes of

$$x^3 + 4x^2y + 4xy^2 + 5x^2 + 15xy + 10y^2 - 2y + 1 = 0.$$

9. Find the asymptotes of

$$x^3 + 4x^2y + 4xy^2 + 5x^2 + 15xy + 10y^2 - 2y + 1 = 0.$$

10. Find the asymptotes of the following curves

i. $xy(x+y) = a(x^2 - a^2)$.

ii. $(x-1)(x-2)(x+y) + x^2 + x + 1 = 0$.

iii. $y^3 - x^3 + y^2 + x^2 + y - x + 1 = 0$.

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 Kirancharan, apy, Noogul, Sullabey, Ishanayan, Ashu Sulekha, K. Reddy, Ashu Sulekha, QKW.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-I

Course Code: 1-P1B	Number of Credits- 01
Title of the Course: Biology Practical	Total Instruction hours - 30 per Semester

PRACTICALS PAPER-I

1. Study of viruses and bacteria using electron micrographs (photographs).
2. Gram staining of Bacteria.
3. Systematic study of locally available plants belonging to the families prescribed in theory syllabus (Minimum of one plant representative for each family).
4. Demonstration of herbarium techniques.
5. Demonstration of double staining technique.
6. Determination of osmotic potential of vacuolar sap by Plasmolytic method using leaves of Rheodiscolor Tradescantia.
7. Determination of stomatal frequency using leaf epidermal peelings / impressions.
8. Separation of chloroplast pigments using paper chromatography technique.
9. Mineral deficiency- Detail study of Micronutrients and Macro nutrients.
10. Identification of C3, C4 and CAM plants.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-I

Course Code: 1-P2	Number of Credits- 01
Title of the Course : Physics Practical	Total Instruction hours - 30 per Semester

Mechanics

1. Study of a compound pendulum determination of 'g' and 'k'.
2. Y by uniform Bending
3. Y by Non-uniform Bending.
4. Moment of Inertia of a fly wheel.
5. Measurement of errors –simple Pendulum.
6. 'Rigidity moduli by torsion Pendulum.
7. Determine surface tension of a liquid through capillary rise method.
8. Determination of Surface Tension of a liquid by different methods.
9. Determine of Viscosity of a fluid.
10. Calculation of slope and intercept of a $Y = mX + C$ by theoretical method

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Text and reference books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi)

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Arun Salika

2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for undergraduate classes

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-I

Course Code: 1-P3	Number of Credits- 01
Title of the Course: Chemistry practical	Total Instruction hours - 30 per Semester

Volumetric analysis

1. Preparation of standard sodium carbonate solution and standardization of HCL
2. Estimation of Carbonate in baking soda
3. Estimation of carbonate and bicarbonate in washing soda
4. Estimation of alkali content in antacid
5. Estimation of Ferrous by dichrometry
6. Estimation of Ferrous and Ferric in the given mixture using standard dichromate
7. Standardization of $\text{Na}_2\text{S}_2\text{O}_3$ using $\text{K}_2\text{Cr}_2\text{O}_7$
8. Estimation of Copper using idometry
9. Preparation of standard Mg^{2+} solution and standardization of EDTA
10. Estimation of $\text{Mg}^{2+}/\text{Ca}^{2+}$
11. Hardness of water
12. Estimation of $\text{Ni}^{2+} / \text{Cu}^{2+}$

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
I	40	10	40	10

No. of Papers: Theory 7 Marks: 7 x 50 = 350
 Practical 3 3 x 50 = 150

Total Marks: 500

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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-T1	Number of Credits- 04
Title of the Course : General English	Total Instruction hours - 60 per Semester

Prescribed General English Text Book for I Year (Sem-I & Sem-II)

Title: *English Made Easy* published by Orient Blackswan

Editors: Prof. E. Suresh Kumar, Prof. Sumita Roy and Prof. A. Karunaker

Unit I

12 h

SHORT FICTION: "A Visit of Charity" by Eudora Welty— PRONUNCIATION: plosives— GRAMMAR: non-finite verbs— VOCABULARY: simile and metaphor— SPELLING: use of 'ie' and 'ei'— PUNCTUATION: semicolon— CONVERSATION: asking for advice/information— READING: Hyderabad city: the heart of Telangana— WRITING: note taking and note making— SOFT SKILLS: time management— VALUES: "Time and tide wait for no one"

Unit II

12 h

PROSE: "Benaras" by Aldous Huxley— PRONUNCIATION: n: fricatives— GRAMMAR: adjective— VOCABULARY: oxymoron and hyperbole— SPELLING: use of 'able' and 'ible'— PUNCTUATION: colon and long dash— CONVERSATION: making/accepting/refusing a request— READING: Burrakatha— WRITING: informal letter— SOFT SKILLS: leadership— VALUES: "The pen is mightier than the sword"

Unit III

12 h

POETRY: "The Sun is Warm" by P.B Shelley— PRONUNCIATION: affricates and nasals— GRAMMAR: articles— VOCABULARY: portmanteau words, loan words— SPELLING: use of 'ic', 'ive', 'ity', 'al', 'ance', 'ence'— PUNCTUATION: hyphen and long dash— CONVERSATION: Conducting a meeting/seeking opinion of team members— READING: Cultural identity of Telangana— WRITING: formal letter— SOFT SKILLS: stress management— VALUES: "Practice makes one perfect"

Unit IV

12 h

DRAMA: An extract of Act II, Sc 3 from *Julius Caesar* by Shakespeare— PRONUNCIATION: Lateral, frictionless continuants, semi vowels— GRAMMAR: adverb— VOCABULARY: palindromes— SPELLING: changes of spelling from noun-verb-adjective- adverb— PUNCTUATION: inverted commas— CONVERSATION: Appearing for a job interview/conducting a job interview— READING: Handicrafts of Telangana— WRITING: business letter— SOFT SKILLS: etiquette and grooming— VALUES: "Necessity is the mother of invention"

Unit V

12 h

Language & Soft Skills Lab: Pronunciation, Conversation, Reading, Soft Skills and Values

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-II

Course Code: 2-T2	Number of Credits- 04
Title of the Course : Telugu	Total Instruction hours - 60 per Semester

ప్రాచీన పద్యభాగం 15 h

1. గజేంద్ర మోక్షము
2. హనుమత్సందేశము
3. సుభాషితములు

ఆధునిక కవిత్వం 15 h

1. అంతర్భాదము
2. ప్రపంచ పదులు
3. రోడ్డురోల్
4. అల్విదా

వచన విభాగం 15 h

1. యుగాంతం
2. ఎంకన్న
3. మామిడి పండు
4. మా ఊరు పోయింది
5. ఇదీ ఒక కళ - పేరులు దారులు గుర్తుంచుకోవడం

భాషా విభాగం 15 h

సంధులు, సమాసాలు

References: Telugu Academy Books

Kirankumar *Dr. N. Srinivas* *Dr. N. Srinivas* *Dr. N. Srinivas*
Dr. N. Srinivas *Dr. N. Srinivas* *Dr. N. Srinivas* *Dr. N. Srinivas*
Dr. N. Srinivas *Dr. N. Srinivas* *Dr. N. Srinivas* *Dr. N. Srinivas*

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-T3A	Number of Credits- 04
Title of the Course : Mathematics	Total Instruction hours - 60 per Semester

Real Analysis

Objective: The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

Outcome: After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

Unit- I

15 h

Sequences: Limits of Sequences- A Discussion about Proofs-Limit Theorems for Sequences- Monotone Sequences and Cauchy Sequences -Subsequences-Lim sup's and Lim inf's-Series- Alternating Series and Integral Tests.

Unit- II

15 h

Continuity: Continuous Functions -Properties of Continuous Functions -Uniform Continuity - Limits of Functions

Unit- III

15 h

Differentiation: Basic Properties of the Derivative - The Mean Value Theorem - L'Hospital Rule - Taylor's Theorem.

Unit- IV

15 h

Integration: The Riemann Integral - Properties of Riemann Integral-Fundamental Theorem of Calculus. Text: Kenneth A Ross, Elementary Analysis-The Theory of Calculus

References:

1. S.C. Malik and Savita Arora, Mathematical Analysis, Second Edition, Wiley Eastern Limited, New Age International (P) Limited, New Delhi, 1994.
2. William F. Trench, Introduction to Real Analysis
3. Lee Larson, Introduction to Real Analysis
4. Shanti Narayan and Mittal, Mathematical Analysis
5. Brian S. Thomson, Judith B. Bruckner, Andrew M. Bruckner; Elementary Real analysis ; Sudhir R., Ghorpade, Balmohan V., Limaye; A Course in Calculus and Real Analysis

Kivanehan *apif* *Moogul* *Suleilly* *Schunayun*
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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-T3B	Number of Credits- 04
Title of the Course : Biology	Total Instruction hours - 60 per Semester

Unit - I:

15 h

1. Principles of Microscopy: Light Microscope and Electron Microscope.
2. Plant cell envelops: Ultra structure of cell wall, molecular organization of cell membranes.
3. Nucleus: Ultra structure, Nucleic acids - Structure of DNA, types and functions of RNA.
4. Prokaryotic and Eucaryotic ribosome organization

Unit-II

15 h

1. Chromosomes: Morphology, organization of DNA in a chromosome with reference to nucleosome model.
2. Euchromatin and Heterochromatin Karyotype. Special types of chromosomes: Lampbrush and Polytene chromosomes.
3. Extra nuclear genome: Mitochondrial DNA and Plastid DNA, Plasmids.
4. Cell division: Cell cycle and its regulation; mitosis, meiosis and their significance, Apoptosis.

Unit-III

15 h

1. Mendelism: Laws of inheritance. Genetic interactions – Epistasis- 12:3:1, 9:3:4, 9:7, Complementary, Supplementary and inhibitory genes.
2. Linkage: A brief account and theories of Linkage. Crossing over: Mechanism and theories of crossing over.
3. Genetic maps: Construction of genetic maps with Two point and Three point test cross data.

Unit – IV

15 h

1. Mutations: Chromosomal aberrations - structural and numerical changes; Gene mutations, Transposable elements: ACDS elements.
2. Gene Organization- Structure of gene, Genetic code, Process of DNA Replication with Polymerase enzyme.
3. Mechanism of transcription in Prokaryotes and Eukaryotes, processing of Eucaryotic m-RNA.
4. Regulation of gene expression in prokaryotes (Lac and Trp. Operons).

References:

1. Sharma, A. K. and A. Sharma. 1999. Plant Chromosomes: Analysis, Manipulation and Engineering. Harward Academic Publishers, Australia.
2. Shukla, R. S. and P. S. Chandel. 2007. Cytogenetics, Evolution, Biostatistics and Plant Breeding. S.Chand & Company Ltd., New Delhi.
3. Singh, H. R. 2005. Environmental Biology. S. Chand & Company Ltd., New Delhi.
4. Snustad, D. P. and M. J. Simmons. 2000. Principles of Genetics. John Wiley & Sons, Inc., U S A.
5. Strickberger, M. W. 1990. Genetics (3rd Ed.). Macmillan Publishing Company.
6. Verma, P. S. and V. K. Agrawal. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd., New Delhi.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-T4	Number of Credits- 04
Title of the Course : Computer Science	Total Instruction hours - 60 per Semester

Unit-I: **15 h**
Introductory concepts: Computer Characteristics – Modes of Operators – Types of Programming languages – Introduction to C – Desirable program characteristics.

C Fundamentals : The C character set – Identifiers and Keywords – Data types- Constants- variables and arrays – Declarations – Expressions – Statements- Symbolic Constants.

Operators and Expressions: Arithmetic operators – Unary operators – Relational and Logical operators- Assignment operators- the conditional operator- Library functions (Chapters 1,2 and 3)

Unit- II: **15 h**
Data Input and Output: Single character input output- Entering input data – Getchar, Utcger, Scanf, printf, gets, Puts functions – Interactive Programming.

Running Complete Programs: Planning, writing entering, compiling and executing programs- Error diagnostics – Debugging techniques.

Control Statements : Branching- The if-else statements- Looping : The while statement – for loop- nested control structures – switch, break, continue, Go to statements (Chapters 4,5 and 6)

Unit-III: **15 h**
Functions : Overview, Definition, Accessing a function – Function prototypes – passing arguments – recursion.

Program Structure: Storage classes – Automatic variables – External/Global variables – static variables – Multic file programs – Library functions.

Arrays: Definition – Processing pointers to functions – Pointers and arrays – Dynamic memory allocation- Arrays and strings (Chapters 7,8 and 9)

Unit-IV: **15 h**
Pointers: Pointer declarations- Passing pointers to functions- pointers and arrays – Dynamic memory allocation – Arrays of Pointers.

Structures and Unions : Defining and processing a structure – User defined data types (typedef) – Structure and Pointers – Passing structures to functions – Unions.

Data files: Opening and closing a Data file- creating a data file – Processing a data file – Unformatted data files (Chapters 10,11 and 12)

Text book:

1. Programming with C, Byron Gottfried, TMH

Reference Books:

Kiranes *Abu* *Abogul* *20* *Callilly* *Chayanjan*
onlaingam *m.h.v.* *KK Reddy* *Arin Salika*

1. Programming and Problem Solving through C Language ITL Education, McMillan India
2. Computer Fundamentals and Programming in C, Dey and Ghosh, Oxford.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-T5	Number of Credits- 04
Title of the Course : Physics	Total Instruction hours - 60 per Semester

Waves and Oscillations

Unit – I: Fundamentals of vibrations

15 h

Simple harmonic oscillator and solution of the differential equation Physical characteristics of SHM, torsion pendulum, - measurements of rigidity modulus, compound pendulum, measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures.

Unit – II: Damped and forced oscillations

15 h

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance. Coupled Oscillators.

Unit – III: Vibrating Strings

15 h

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance

Unit – IV: Vibrations of bars

15 h

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the midpoint iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

NOTE: Problems should be solved at the end of every chapter of all units.

Text and reference books

1. D.P. Khandelwal, "A laboratory manual for undergradu
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for ate classes" (Vani Publishing House, New Delhi).

Kiraneha *aby* *Noorjail* *Calabady*
Abbas Balcha *K.R. Reddy* *Ishtiyaz*
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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-T6	Number of Credits- 04
Title of the Course : Chemistry	Total Instruction hours - 60 per Semester

Inorganic Chemistry

Unit – I: Chemical bonding

10 h

Valence shell electron pair repulsion (VSEPR) theory – Shapes of inorganic molecules, Molecular orbital(MO) theory – Principles, Linear Combination of atomic orbitals, Types of Molecular orbitals – bonding, antibonding and non-bonding. Molecular orbital energy diagrams of H_2 , He_2^+ , B_2 , C_2 , N_2 , O_2 , O_2^- , O_2^{2-} , F_2 , CO , NO and HF – Bond order and magnetic properties.

Unit-II: Chemistry of p-block elements

10 h

Hydrides of boron- Diborane and tetraborane – Synthesis, structure and bonding, Halides of boron – Relative stability and lewis acidity. Silicates – Preparation, Structures of Orthosilicates, Pyrosilicates, Cyclic silicates, sheet silicates and 3- dimensional silicates and their uses. Iliciones – Preparation, Classification – Straight chain, Cyclic and cross- linked, Uses.

Organic Chemistry

Unit-III: Hydroxy Compounds

10 h

Classifications of hydroxyl compounds. Preparation: from carbonyl compounds, Aryl carbinols by hydroxymethylation. Phenols preparation-(a) by diazotization (b) from sulfonic acid (c) from cumene (d) by hydrolysis of halobenzene. Physical Properties-Hydrogen bonding (intermolecular and intramolecular) effect of hydrogen bonding on boiling point and water solubility Chemical Properties (a) acidic nature of phenols (b) formation of alkoxide/phonoxides and their reaction with alkyl halides (c) replacement of OH byhalogen using PCl_5 , PBr_3 , $SOCl_2$ and with $HX/ZnCl_2$. Esterification by (a) acid halides, anhydrides and acids (mechanism) (b) dehydration of alcohols. Oxidation of alcohols by CrO_3 , $KMnO_4$. Special reactions of Phenols-(a) Bromination, (b) Kolbe-Schmidt reaction (c) RiemerTiemann (d) Azo coupling. Poly hydroxy compounds: Pinacol-Pinacolone rearrangement, Oxidative cleavage ($Pb(OAc)_4$ & HIO_4)

Unit-IV: Carbonyl Compounds

10 h

Synthesis of aldehydes & ketones from (a) Acid chloride (b) by using 1,3-dithianes (c) nitriles(d) Oppenauer oxidation. Special methods for preparing aromatic aldehydes and ketones by (a) Oxidation of arenes (b) Hydrolysis of benzal halides.Keto-enoltautomerism, polarisability of Carbonyl groups, reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity o- Addition of (a) $NaHSO_3$ (b) HCN (c) $RMgX$ (d) NH_3 (e) RNH_2 (f) NH_2OH (g) $PhNHNH_2$ (h) 2,4-DNP. Schiff bases, addition of alcohols-hemi acetal and acetalformation, Halogenation using PCl_5 with mechanism. Base catalysed reactions-with particular emphasis on (Aldol, Cannizaro reaction, Perkin reaction, Benzoin condensation, Haloformreaction. Oxidation reactions- $KmnO_4$ oxidation and autooxidation, reduction-catalytic hydrogenation, Clemmenson's reduction, Wolf-Kishner reduction, MPV reduction, reduction with LAH, $NaBH_4$. Analysis of carbonyl compounds 2,4 DNP test, Tollen's test,Fehlings test, Scihff's test, andhaloform test.

Physical Chemistry

Unit-V: Colligative Properties

10 h

Solutions of non volatile solutes, Vapour Pressure, Raoult's law, Lowering of Vapour Pressure, Relative lowering of vapour pressure, elevation in boiling point and depression in freezing point and their relation with molecular weight of solute. Determination of molecular weight by measuring these properties (each one method) Osmosis. Osmotic pressure and laws of osmosis molecular weight determination from osmotic pressure (Berkley and Hartley's method). Abnormal behaviour of electrolytes – Vant Hoff's factor – Problems.

Unit-VI: Colloids

10 h

Colloidal state of matter – Classification of Colloids - Lyophillic and lyophobic colloidal solutions. Preparation and properties (Kinetic, optical and electrical). Stability of colloids, Protective action. Hardy – Schulz law, gold number emulsions types of emulsions and their preparation. Gels- Classification, Preparation and Properties imbibition – Applications of Colloids

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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-P1A	Number of Credits- 01
Title of the Course: Mathematics Practical	Total Instruction hours - 30 per Semester

UNIT-I

- List the first five terms of the following inductively defined Sequences.
 (i) $s_n = \frac{1}{n^2 + 2}$ (ii) $s_1 = 1, s_n = 3s_{n-1} + 1$; (iii) $s_1 = 1, s_2 = 2, s_{n+2} = \frac{s_{n+1} + s_n}{s_{n+1} - s_n}$;
- Check whether the following Sequences Convergent . Find the Limit/ Limit Point of the Sequences, g.l.b, l.u.b if exists
 (i) $\left\{\frac{1}{n}\right\}$ (ii) $\{\sqrt[n]{n+1} - \sqrt[n]{n}\}$ (iii) $(-1)^n$
- Show that the following Sequences are bounded and check for the convergence.
 (a) $\left\{\frac{n+2}{n^2 + 2n + 2}\right\}$, (b) $\left(1 + \frac{1}{n}\right)^n$
- Check for the convergence of the following Sequences by using appropriate methods.
 (a) $s_n = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{n}$ (b) $s_n = \frac{1}{n^2 + 1} + \frac{1}{n^2 + 2} + \dots + \frac{1}{n^2 + n}$
 (c) $s_n = 1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \dots + \frac{1}{n!}$ (d) $s_n = \frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n.(n+1)}$
- Show that the following Sequences converges.
 (a) $s_1 = \sqrt{3}, s_{n+1} = \sqrt{3s_n}$ converges to 3.
 (b) $s_1 = 1, s_{n+1} = \sqrt{5 + s_n}$ converges to positive root of $x^2 - x - 5 = 0$
- Find the limits of (i) $s_n = \frac{1}{(n!)^{1/n}}$ (ii) $s_n = \left(\frac{2^n}{(n!)}\right)^{1/n}$
- Check for the Convergence of the following Series by Using appropriate Tests.
 (a) $\sum \left(\frac{n+1}{2n+5}\right)^n$ (b) $\sum \left(1 + \frac{1}{n}\right)^{-n^2}$ (c) $\sum \left(\frac{n^2}{3^n}\right)$ (d) $\sum \frac{x^n}{n}; x > 0$
- Convergence and Test for Absolute Convergence of the following Series.
 (a) $1 - \frac{1}{2^p} + \frac{1}{3^p} - \frac{1}{4^p} + \dots, p > 0.$ (b) $\sum \frac{(-1)^n}{n};$ (c) $\sum \frac{\cos nx}{n^2}$
- If $(s_n) = (0, 1, 2, 1, 0, 1, 2, 1, 0, 1, 2, 1, 0, \dots)$ $(t_n) = (2, 1, 1, 0, 2, 1, 1, 0, 2, 1, 1, 0, \dots)$ find
 a) $\liminf(s_n) + \liminf(t_n)$ b) $\liminf(s_n) + \limsup(t_n)$
 c) $\limsup(s_n) + \limsup(t_n)$ d) $\limsup((s_n + t_n))$
- Prove $\limsup |s_n| = 0$ if and only if $\lim s_n = 0$

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Prasanna

UNIT-II

1) Find the Limits of the following functions if exists.

$$f(x) = \begin{cases} x - [x] & \text{when } [x] \neq 0 \\ 0 & \text{when } [x] = 0 \end{cases}$$

2) If $f: \mathbb{R} - \{0\} \rightarrow \mathbb{R}$ is defined as $f(x) = x \left(\frac{e^{1/x} - 1}{e^{1/x} + 1} \right)$ show that $\lim_{x \rightarrow 0} f(x) = 0$.

3) Find $\lim_{x \rightarrow 0} f(x)$ if $f(x) = \frac{e^{1/x} - e^{-1/x}}{e^{1/x} + e^{-1/x}}$

4) If $f(x) = \begin{cases} x & \text{if } x \text{ is rational} \\ -x & \text{if } x \text{ is irrational} \end{cases}$ show that $\lim_{x \rightarrow 0} f(x)$ exists only at $x = 0$

5) Verify whether the given functions are continuous at given point. If not find the type of discontinuity.

(a) $f(x) = \begin{cases} 1 & \text{if } x \text{ is rational} \\ -1 & \text{if } x \text{ is irrational} \end{cases}$ at all Real Numbers.

6) $f(x) = x^m \sin \frac{1}{x}$ at $x = 0$ (c) $f(x) = \begin{cases} \left(\frac{e^{1/x} - e^{-1/x}}{e^{1/x} + e^{-1/x}} \right) & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$

7) Define Uniform Continuity. Check the following functions are uniform continuous ? $f(x) = \frac{1}{x}$ on $(0, 1]$

8) Check the following functions are uniform continuous ? $f(x) = x^2$ on $[-1, 1]$ and on \mathbb{R}

9) Prove that the function f defined on \mathbb{R}^+ as $f(x) = \sin \frac{1}{x} \forall x > 0$, is continuous but not uniformly continuous on \mathbb{R}^+

10) Examine the Continuity and Uniform Continuity of f defined by $f(x) = \lim_{n \rightarrow \infty} \frac{x^n}{1 + x^n e^x} \forall x \geq 0$, $n > 0$.

UNIT-III.

1) Check the following functions are differential at a given points

(a) $f(x) = |x| + |x-1| + |x-2|$ at $x = 0, 1, 2$

(b) $f(x) = \begin{cases} 5x-4 & \text{if } 0 \leq x \leq 1 \\ 4x^2-3x & \text{if } 1 \leq x \leq 2 \\ 3x+4 & \text{if } x \geq 2 \end{cases}$ at $x = 1, 2$

2) Find the value of m such that $f(x) = \begin{cases} x^m \sin \frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ is differentiable at

3) Define Rolle's Theorem and discuss the applicability for the following Functions.

(a) $f(x) = x^3 - 6x^2 + 11x - 6$ on $[1, 3]$ (b) $f(x) = \sin x$ on $[0, \pi]$

4) Define Lagrange's Mean Value Theorem discuss the applicability for the

Kiransh
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K. Reddy
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Sakshi

following functions.

(a) $f(x) = \frac{1}{x}$ on $[-1, 1]$ (b) $f(x) = \log x$ on $[1, e]$

(c) $f(x) = 1 + x^2$ on $[1, 2]$

5) Define Cauchy's Mean Value Theorem. If

$f(x) = \frac{1}{x^2}, g(x) = \frac{1}{x}$ then show that 'c' is the Harmonic Mean of a, b where $0 < a < b$.

6) Define Taylor's Theorem and Mc Lauren's Theorem and find the Taylor's Series/ Mc Lauren's Series to the following functions.

(a) $\sin x$ at $x = 0, x = \frac{\pi}{2}$ (b) $\cos x$ at $x = 0, x = \frac{\pi}{4}$

7) Let f be a function defined on \mathbb{R} and $f(x+y) = f(x) + f(y), \forall x, y \in \mathbb{R}$ then show that (i) f is continuous then $f(x) = x \cdot f(1), \forall x \in \mathbb{R}$

8) By using L'Hospital Rule find the following Limits.

(a) $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{1/x^2}$

(9) $\lim_{x \rightarrow \infty} \frac{x^3}{e^x}$

(10) $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{\sin x} \right)$ on $\left(0, \frac{\pi}{2} \right)$

UNIT-IV

1) Define Upper Riemann Sum, Lower Riemann Sum, Oscillatory sum, Lower Riemann Integral, Upper Riemann Integral.

2) Find Upper Riemann Sum, Lower Riemann sum, Oscillatory sum for the following functions.

(a) $f(x) = 2x - 1$ on $[0, 1]$ with $P = \left\{ 0, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, 1 \right\}$

(b) $f(x) = \sin x$ on $[0, \pi]$, with $P = \left\{ 0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi \right\}$

3) Check whether the following functions are Riemann Integrable or not by finding Upper and Lower Riemann Integrals and also find Riemann Integral if it exists.

(a) $f(x) = 3x - 1$ on $[1, 2]$

(4) $f(x) = \begin{cases} 1 & \text{if } x \in Q \\ -1 & \text{if } x \in R \setminus Q \end{cases}$ on $[a, b] \subseteq R$

(5) $f(x) = \begin{cases} 2 & \text{if } 0 \leq x \leq 1 \\ 1 & \text{if } 1 \leq x \leq 2 \end{cases}$ on $[0, 2] \subseteq R$

(6) $f(x) = \frac{1}{a^{n-1}}$ if $\frac{1}{a^n} \leq x \leq \frac{1}{a^{n-1}}, a > 1$ and $f(0) = 0$.

(7) $f(x) = \begin{cases} 2rx, & \frac{1}{r+1} < x \leq \frac{1}{r} \\ 0 & \text{if } x = 0 \end{cases}$ on $[0, 1], r \in \mathbb{N}$.

8) Find the following by using appropriate theorems (First Mean Value Theorem etc...)

(a) $\frac{\pi}{4} \leq \int_0^{\pi/4} \sec x dx \leq \frac{\pi}{2\sqrt{2}}$ (b) $4 \leq \int_1^3 \sqrt{3+x^3} dx \leq 2\sqrt{30}$

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KR Reddy

Alexis Salas

Find the following Infinite Limits.

$$(9) \lim_{n \rightarrow \infty} \left(\frac{1}{n} + \frac{n^2}{(n+1)^3} + \frac{n^2}{(n+2)^3} + \dots + \frac{1}{8n} \right) = \frac{3}{8}$$

$$(10) \lim_{n \rightarrow \infty} \frac{1}{n^2} \sum_{r=0}^{n-1} \sqrt{n^2 - r^2}$$

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-P1B	Number of Credits- 01
Title of the Course: Biology Practical	Total Instruction hours - 30 per Semester

Biology and Genetics

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies.
2. Study of various stages of mitosis using cytological preparation of Onion root tips.
3. Study of various stages of meiosis using cytological preparation of Onion flower buds.
4. Solving genetic problems related to monohybrid, dihybrid ratio incomplete dominance and interaction of genes (minimum of six problems in each topic).
5. Construction of linkage maps; two and three-point test cross.
6. Study of ultra-structure of cell organelles using photographers. Chloroplast, Mitochondria, Nucleus, Ribosomes, Endoplasmic reticulum, and Golgi complex.
7. Study of Special types of Chromosomes (Polytene chromosome and Lamp brush chromosomes- Permanent slide).

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-P2	Number of Credits- 01
Title of the Course : Computers practical	Total Instruction hours - 30 per Semester

MS-WORD

1. Create a leave letter in word in a neat format
2. Create a word document using various bullet options
3. Create a word document implementing usage of clip art in word documents
4. Create a word document implementing various font styles, size, and superscript options
5. Create a word document implementing header and footer
6. Create a word document implementing mail merge.

Kirankumar *Apur* *Noorjil* *Saleem* *Shayam*
mbaiz *M. Gilla* *K.R. Reddy* *Arun Salha*
PKV

MS-EXCEL

1. Create excel sheet by entering data with fields
- 2.

S.NO	NAME	M1	M2	M3	M4	M5

2. For the above excel sheet add columns total, Average and fill them using formulas
3. Create an excel sheet by entering sample data with filed and adjust all the data to center

S.NO	NAME	M1	M2	M3

3. Create an excel sheet by entering sample data with fields

YEAR	POPULATION	LETERACY%

AND DRAW

- A) Line graph with year on x- axis literacy, population on y- axis
- B) Bar graph with year on x- axis and population on y- axis

4. Create a pie – chart by using fields

Compound	No. of Hydrogen Atoms	No. of Oxygen Atoms	No. of Sulfher Atoms
H ₂ SO ₄	2	4	1

POWER POINT

1. Create a simple power point presentation for Tollens' test using design templates
2. Create a simple power point presentation for Benedict's test using bullets, header and footer
3. Create a simple power point presentation using clipart in the presentation
4. Create a simple power point presentation importing images into the presentation

ACCESS

1. Create an access data base of students with fields

S.NO	NAME	ADRESS	M1	M2	M3	M4	M5

- A) To the above data base append total and average field
- B) Find a record with name Ravi
- C) Sort the field in ascending order on name filed
- D) Build a query to select the records of students who's total is above 300

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m. b. g. m *m. b. g. m* *CRW* *K R Reddy* *Abhishek*

2. Design a form in access using form wizard
3. Generate a report in Access from sample database

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-II

Course Code: 2-P3	Number of Credits- 01
Title of the Course: Physics Practical	Total Instruction hours - 30 per Semester

Waves and Oscillations

1. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
2. Study of Oscillations under Bifilar suspension.
3. Study of oscillations of a mass under different combination of springs.
4. Verification of Laws of a stretched string (Three Laws).
5. Determination of frequency of a Bar-Melde's experiment.
6. Observation of Lissajous figures from CRO.
7. Volume Resonator –determination of frequency of a tuning fork.
8. Velocity of Transverse wave along a stretched string.
9. Study of damping of a bar pendulum
10. Study of coupled oscillator.

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Text and reference books

1. D.P. Khandelwal, "A laboratory manual for undergradu
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for ate classes" (Vani Publishing House, NewDelhi).

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mhaigan *Muth* *KR Reddy* *Aban* *Saleha*
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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-II

Course Code: 2-P4	Number of Credits- 01
Title of the Course : Chemistry Practical	Total Instruction hours - 30 per Semester

Semi-micro qualitative analysis of Inorganic salt mixture containing two anions and two cations (with interfering anion radical)

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
II	40	10	40	10

No. of Papers: Theory 6 Marks: 6 x 50 = 300
 Practical 4 4 x 50 = 200

Total Marks: 500

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-III

Course Code: 3-T1	Number of Credits- 04
Title of the Course : English	Total Instruction hours - 60 per Semester

UNIT I: 12 h
 Poem: Charlotte Brontë "Life"; Short Story: Rabindranath Tagore "A Wrong Man in Workers' Paradise"; Vocabulary: Synonyms, Antonyms; Grammar: Prepositions (including Prepositional Phrases)

UNIT II: 12 h
 Poem: Kamala Das "Punishment in Kindergarten"; Essay: RK Narayan "Toasted English"; Vocabulary: British/American English Common Words; Grammar: Voice

UNIT III: 12 h
 Poem: Langston Hughes "As I Grew Older"; Speech: BR Ambedkar "Grammar of Anarchy" (Excerpt); Vocabulary: Phrasal Verbs; Grammar: Concord

UNIT IV: 12 h
 Writing-I (Essay Writing); Discursive Essay; Argumentative Essay; Vocabulary: Idioms
 Grammar: Connectives

UNIT V: 12 h
 Writing-II (Report Writing); Business Reports; Media Reports; Vocabulary: Technical;
 Vocabulary (Business, Media); Grammar: Reported Speech (Including Reporting Verbs)

30

Kirana *Abu* *M. Siv* *30* *Chellu* *Manojan*
Pradeep *Arjun*

Reference:

Prescribed Textbook for Semesters III & IV: *English in Use*. Eds. T Vijay Kumar, K DurgaBhavani, YL Srinivas. Published by Macmillan.

**DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-III**

Course Code: 3-T2	Number of Credits- 04
Title of the Course : Telugu	Total Instruction hours - 60 per Semester

ప్రాచీన పద్యభాగం

15 h

- | | | |
|--------------------------|-----|------------------|
| 1. ధర్మజుని వాక్యాతుర్యం | ... | తిక్కన |
| 2. విభీషణ శరణాగతి | ... | గోన బుద్ధారెడ్డి |
| 3. గుణనిధి కథ | ... | శ్రీనాథుడు |

ఆధునిక పద్యభాగం

15 h

- | | | |
|--------------------------|-----|---------------------------|
| 1. రైతు ప్రశస్తి | ... | వానమామలై జగన్నాథాచార్యులు |
| 2. గురుదక్షిణ | ... | అంబటి లక్ష్మీనరసింహరాజు |
| 3. గుడిసెలు కాలిపోతున్నై | ... | డా॥ బోయి భీమన్న |

వచన విభాగం (నాటకం)

15 h

చలిచీమలు (సాంఘిక నాటకం) ... పి.వి. రమణ

అలంకారాలు

15 h

శబ్దాలంకారాలు : వృత్తసుప్రాస, ఛేకాసుప్రాస, లాటాసుప్రాస, అంత్యాసుప్రాస, యమకం, ముక్తపదగ్రస్తాలంకారాలు.

అర్థాలంకారాలు : ఉపమ, ఉత్పేక్ష, రూపక, స్వభావోక్తి, ఉల్లేఖ, అర్థాంతరన్యాస, శ్లేష, దృష్టాంతాలంకారాలు.

References: Telugu Academy Books

Kirancha *any* *Noor* *Chellu* *Krishna*
nsa *m. n* *K. R. R.* *Abus Saleha*
R. W.

PALAMURU UNIVERSITY
DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
SEMESTER-III

Course Code: 3-T3A	Number of Credits- 04
Title of the Course : Mathematics	Total Instruction hours - 60 per Semester

Algebra

Objective: The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.

Outcome: On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

Unit- I

15 h

Groups: Definition and Examples of Groups- Elementary Properties of Groups-Finite Groups - Subgroups - Terminology and Notation -Subgroup Tests - Examples of Subgroups.

Cyclic Groups: Properties of Cyclic Groups - Classification of Subgroups Cyclic Groups.

Unit- II

15 h

Permutation Groups: Definition and Notation -Cycle Notation-Properties of Permutations -A Check Digit Scheme Based on D_5 . Isomorphisms ; Motivation- Definition and Examples - Cayley's Theorem Properties of Isomorphisms -Automorphisms-Cosets and Lagrange's Theorem Properties of Cosets - Lagrange's Theorem and Consequences-An Application of Cosets to Permutation Groups -The Rotation Group of a Cube and a SoccerBall.

Unit- III

15 h

Normal Subgroups and Factor Groups: Normal Subgroups-Factor Groups -Applications of Factor Groups. - Group Homomorphisms - Definition and Examples -Properties of Homomorphisms -The First Isomorphism Theorem.

Unit- IV

15 h

Introduction to Rings: Motivation and Definition -Examples of Rings -Properties of Rings - Subrings;Integral Domains: Definition and Examples - Fields - Characteristics of a Ring.Ideals and Factor Rings: Ideals -Factor Rings -Prime Ideals and Maximal Ideals.

Text Book

- Joseph A.Gallian, Contemporary Abstract Algebra (9th edition)

References:

- Bhattacharya, P.B Jain, S.K.; and Nagpaul, S.R,Basic Abstract Algebra Fraleigh, J.B, A First Course in Abstract Algebra.
- Herstein, I.N, Topics in Algebra.

Kiranehan *Abu* *Abogin* *Chellaly* *Shayam*
Aravindan M. Giv *K. P. Reddy* *Aban Saleha*
P. S. W.

PALAMURUUNIVERSITY
DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
SEMESTER-III

Course Code: 3T3B	Number of Credits- 04
Title of the Course : Biology	Total Instruction hours - 60 per Semester

BIOCHEMISTRY

Unit-I:

15 h

Carbohydrates: Introduction, definition, classification, structures, Tests for identification and differentiation, principles in quantitative analysis. Metabolism of carbohydrates: hydrolysis, TCA, ETC, HMP Shunt, glycogens, glycogenesis, glycogenolysis, definition of carbohydrate metabolism.

Unit-II:

15 h

Amino acids, peptides & proteins: Classification and biological importance of protein, metabolism of amino acids, Transamination, deamination, decarboxylation, urea cycle, Diseases associated with defects in amino acids and protein metabolism.

Unit-III:

15 h

Fatty Acids and Lipids Classification and biological importance of lipids; Fatty acids: Structures, isomerism, properties and classification, Fats and oils, waxes; Triacyl glycerols, Phospholipids and Spingo lipids;

Unit-IV:

15 h

Nucleic acids: Purine and pyrimidine bases, sugars, nucleotides, nucleosides, Introduction to Replication, Transcription, Translation, Mutations, Genetic code; Enzymes: History, nomenclature and classification of enzymes; Properties of enzymes, role of co-factors and co-enzymes; Mechanism of action of enzymes; Kinetics of enzymes, double reciprocal plot, Km and Vmax; factors effecting enzymatic action; Enzyme inhibition. Enzymes as targets of drugs, enzymes from natural sources and their applications.

References:

1. Biochemistry By Prof. U. Satyanarayana
2. Biochemsitry By Voet & Voet
3. Biochemistry By Lehninger

PALAMURUUNIVERSITY
DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
SEMESTER-III

Course Code: 3T4	Number of Credits- 04
Title of the Course : Computer Science	Total Instruction hours - 60 per Semester

Unit – I:

15 h

DATABASE ENVIRONMENT: Basic concepts, File processing systems, Range of Database applications, Advantages, components of Database Environment, DATA DEVELOPMENT PROCESS: Database development with information system Development process: Three Scheme Architecture for Database Development: Three-tiered Database Location Architecture. (CHAPTERS 1 & 2)

33

K. Venkatesh *Abhy* *M. G. S.* *33* *Chellab* *Chandrasekhar* *Abhis* *Salha*

Unit – II:**15 h**

MODELING DATA IN THE ORGANIZATION : Modeling the rules of the organization: the E.R. Model: Entity – Relationship Model Constructs: Relationships. ENHANCED E-R MODEL AND BUSINESS RULES. Representing super types and subtypes: Specify: Constraints in super type/sub type relationships: EER modeling examples (CHAPTERS 3 & 4)

Unit – III:**15 h****LOGIC DATABASE DESIGN AND THE RELATIONAL MODEL:**

The Relational Data Model: Integrity constraints Transforming EER- Diagrams into Relations: Introduction to Normalization, The Basic Normal forms: Merging Relations. ADVANCED NORMAL FORMS: Boyer Codd Normal Form: Fourth Normal Form: Higher Normal Form: PHYSICAL DATABASE DESIGN AND PERFORMANCE: Physical Database Design process: Designing Fields, Designing Physical data records and De-normalization, Designing Physical Files: Using and selecting indexes: Designing Database: Optimising for query performance (CHAPTER 5, APPENDIX B60)

Unit – IV:**15 h**

SQL: The SQL environment, defining a Database in SQL: Inserting, Updating and Deleting data: Internal Scheme Definitions in RDMS, Processing single Table, ADVANCED – SQL: processing multiple tables: Ensuring transaction integrity, Data Dictionary Facilities: SQL – 99 enhancements and extensions to SQL: Triggers and Routines embedded SQL and Dynamic SQL, (CHAPTERS 7 & 8)

Reference Book:

Modern Database Management, F.R. Macfadden et al, (Pears U Education, VI Ed)

PALAMURU UNIVERSITY
DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
SEMESTER-III

Course Code: 3T5	Number of Credits- 04
Title of the Course : physics	Total Instruction hours - 60 per Semester

Electromagnetism and Electronics**Unit – I****15 h**

Electrostatics& Dielectrics: Gauss law and its application, electric field due to uniformly charged sphere, Mechanical force on a charged conductor; Electric potential- potential due to a charged spherical conductor, electric dipole. An atomic view of dielectrics, potential energy of a dipole in an electric field, Polarization and charge density.

Dielectrics and Gauss's law. Relation between D, E, and P - Dielectric constant and susceptibility. Capacitance: Capacity of concentric spheres, capacity of parallel plate condenser with and without dielectric. Electric energy stored by a charged condenser- force between plates of condenser.

Unit – II**15 h**

Magneto statics: Magnetic shell, potential due to magnetic shell, field due to magnetic shell, magnetic induction (B) and field (H), permeability and susceptibility, Dia. Para and ferro-magnetic materials (qualitative), concepts of magnetic domains, Hysteresis loop, B-H curve-theory and experiment.

PALAMURU UNIVERSITY
DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
SEMESTER – III

Course Code: 3T6	Number of Credits- 04
Title of the Course : Chemistry	Total Instruction hours - 60 per Semester

Inorganic Chemistry

Unit-I: Chemistry of d- and f-block elements

10 h

- a) d-block elements – position in the periodic table, Electronic configuration, General Characteristics, atomic and ionic radii, Ionization energy, variable oxidation states, Radox potentials, Special properties, Colour and magnetic properties, Catalytic activity and complex formation tendency.
- b) f-block elements – Position in the periodic table, electronic configuration, Landthanide contraction – Cause and its consequences. Spectral, magnetic and complex formation properties.

Unit – II : Theories of metallic bond

10 h

Valence bond theory – Salient features, Explanation of metallic properties and its limitations. Free electron theory – Principles, Explanation of electrical conductivity in metals and its limitations. Band theory – Formation of bands, Brillouin zones, Conductors, Semiconductors and Insulators.

Organic Chemistry

Unit – III : Carboxylic acids and esters

10 h

Methods of preparation (a) Hydrolysis of nitriles, amides and esters (b) Carbonation of Grignard reagents (c) Hydrolysis of benzotrichlorides (d) Kolbe reaction. Physical properties- hydrogen bonding, dimeric association, acidity-strength of acids with the examples trimethyl acetic acid and trichloro acetic acid, Relative differences in the acidity of aromatic and aliphatic acids. Chemical properties-reactions involving H, OH and COOH groups-salt formation, anhydride formation, acid halide formation, esterification and amide formation. Reduction of acid to the corresponding primary alcohol-via ester or acid chloride. Degradation of carboxylic acids by Huns decker reaction, Schmidt reaction (Decarboxylation). Arndt-Eistert synthesis, Halogenation by Hell-Volhard-Zelensky reaction. Acidity of-Hydrogens of acetoacetic and malonic esters structure of carbanion. Preparation of Aceto acetic ester by Claisen condensation and synthetic applications of Aceto acetic ester. (a) Acid hydrolysis and Ketonic hydrolysis. Preparation of (i) monocarboxylic acids (ii) dicarboxylic acids (b) malonic ester – synthetic application. Preparation of (i) Substituted mono carboxylic acids (ii) substituted dicarboxylic acids (iii) trialkyl acetic acid.

Unit-IV : Nitrogen compounds

10 h

Nitro hydrocarbons: Tautomerism of nitroalkanes leading to acid and keto form. Preparation of nitroalkanes. Chemical properties (a) Halogenation (b) Reaction with HNO₂ (nitrous acid) (c) Nef reaction (d) Mannich reaction leading to Michael addition (e) Reduction. Aromatic nitro hydrocarbons: Physical Properties, Chemical reactivity-orientation of electrophilic substitution on nitrobenzene. Reduction reactions of nitrobenzenes in different media.

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 Kiran Kumar, apy, Nagaraj, 36, Call Bell, Jayaraman, Anand Palsha, n. h. v., P. S. W., K. P. Reddy.

Aliphatic and Aromatic amines: Preparative methods (a) Amonolysis of alkyl halides (b) Gabriel synthesis (c) Hoffman's bromamide reaction (mechanism) (d) Reduction of amides (e) Schmidt reaction. Physical properties and basic character: comparative basic strength of ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline, comparative basic strength of aniline, N-methylaniline and N, N-dimethyl aniline(in aqueous and non-aqueous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts. Chemical Properties(a) Alkylation (b) Acylation (c) Carbylamine reaction (d) Hinsberg's separation (e) Aliphatic and aromatic 1°, 2°, 3° amines reactions with nitrous acid. Electrophilic substitutions of aromatic amines (a) Bromination (b) Nitration (c) Oxidation of aryl and 3° amines (d) Diazotization. Preparation of diazonium salts with mechanism. Chemical properties(a) Replacement of diazonium group by OH, Cl groups (Sand Meyer and Gatterman reaction) (b) Replacement of diazonium group by F group (Schiemann's reaction) (c) Replacement of diazonium group by I, CN, NO₂, H and aryl groups. Coupling reaction of diazonium salts (a) With phenols (b) With aniline (c) Reduction to phenyl hydrazines.

Physical Chemistry

Unit – V: Thermodynamics-1

10 h

Terms involved – Types of systems – Extensive and intensive properties – state and path dependent functions reversible and irreversible processes, heat, work, internal energy and enthalpy. First law of Thermodynamics – Mathematical representation, Heat capacities of gases at constant volume and at constant pressure – their relationship – workdone in reversible isothermal and adiabatic processes, adiabatic equation of state – Problems – Heat changes during chemical reactions – Hess's law, Thermochemical equations – Heat of reaction, Heat of formation, Heat of combustion, Heat of neutralization – Temperature dependence of heat of reaction – Kirchoff's equation – derivation. Problems.

Unit – VI: Electrochemistry – 1

10 h

Electrolytic conduction, Specific and equivalent conductance – Measurement – Their variation with dilution – Kohlraush's law of ionic conductances migration of ions – Transport numbers – Determination by Hittorf's method for non attachable electrodes – conductance variation of strong and weak electrolytes with dilution (Only qualitative treatment) – Onsagar equation (no deriation) – Degree of dissociation Ostwald's dilution law. Applications of conductance measurements – Ka of acids – Ksp of sparingly soluble salts, Conductometric titrations – Problems.

PALAMURU UNIVERSITY
DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
SEMESTER – III

Course Code: 3P1A	Number of Credits- 01
Title of the Course : Maths Practical	Total Instruction hours - 30 per Semester

Algebra

Unit-I

1. Show that the set(1,2,34) is a group under multiplication modulo 5
 2. Let G be a group with the property that for any x, y, z in the group, $xy = zx$ implies $y = z$. Prove that G is Abelian.
 3. Find the Normal sub groups of (i) $(G, \cdot) = \{1, -1, i, -i\}$. (ii) $(\mathbb{Z}_7^*, \times_7)$.
- is a group under multiplication.

4. Let G be the group of polynomials under addition with coefficients from \mathbb{Z}_{10} . Find the orders of

$$f(x) = 7x^2 + 5x + 4, g(x) = 4x^2 + 8x + 6, \text{ and } f(x) + g(x)$$

5. If a is an element of a group G and $|a| = 7$, show that a is the cube of some element of G .

6. Find the generators of the cyclic group of order n where $n = 6, 10, 25, 19, 30$

7. How many subgroups does \mathbb{Z}_{20} have? List a generator for each of these subgroups.

8. Consider the set $\{4, 8, 12, 16\}$. Show that this set is a group under multiplication modulo 20 by constructing its Cayley table. What is the identity element? Is the group cyclic? If so, find all of its generators.

9. Prove that a group of order 4 cannot have a subgroup of order 3.

10. If $S = \left\{ \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix} / a, b \in \mathbb{Z} \text{ and } ab \neq 0 \right\}$ is a Subgroup of the set of all 2×2 non-singular matrices with respect to matrix multiplication.

Unit-II

1. Find all of the left cosets of $\{1, 11\}$ in $U(30)$

2. Determine whether the following permutations are even or odd.

a. (135) b. (1356) c. (13567) d. (12)(134)(152) e. (1243)(3521)

4. Let $G = U(16)$, $H = \langle 1, 15 \rangle$ and $K = \langle 1, 19 \rangle$. Are H and K isomorphic? Are G/H and G/K isomorphic?

5. Suppose that f is a homomorphism from \mathbb{Z}_{30} to \mathbb{Z}_{30} and $\text{Ker } f = \langle 0, 10, 20 \rangle$. If $f(3) = 9$, determine all elements that map to 9.

6. How many Abelian groups (up to isomorphism) are there

- of order 6?
- of order 15?
- of order 42?
- of order pq , where p and q are distinct primes?
- of order pqr , where p, q, r are distinct primes?

7. Find the regular permutation Group isomorphic to $(G, \cdot) = \{1, -1, i, -i\}, (\mathbb{Z}_5, \times_5)$

8) Classify whether the following permutations are even or odd if $f = (1234)(567)(235)$,

$$g = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 7 & 5 & 6 & 4 & 3 & 1 & 2 \end{pmatrix} \text{ in } S_7$$

9) Find the generators of the cyclic group of order n where $n = 6, 10, 25, 19, 30$

10) Find the order of the permutations $f = (1235)(2354)(153)$, $g = (1235)(235)(15)$ in a group (S_5, \circ) .

UNIT-III

1. Show that the mapping $f(a + bi) = a - i$ is an automorphism of the group of complex numbers under addition.

2. Find the Normal sub groups of (i) $(G, \cdot) = \{1, -1, i, -i\}$.
Consider the following maps:

(3) $f: (Z, +) \rightarrow (G, \cdot)$ defined as $f(x) = i^x$ where $(G, \cdot) = \{1, -1, i, -i\}$

(4) $f: (Z, +) \rightarrow (Z, +)$ defined as $f(a) = a + 1$

(5) $f: (R, +) \rightarrow (R^+, \cdot)$ defined as $f(x) = e^x$

(6) $f: (R^+, +) \rightarrow (R^+, \cdot)$ defined as $f(x) = x^2$

(7) $f: (R^+, \cdot) \rightarrow (R, +)$ defined as $f(x) = \log x$

Check whether the above maps are isomorphism or not? Find also their kernels.

8. $H = \begin{pmatrix} a & b \\ 0 & d \end{pmatrix}$ IS H a normal subgroup of $GL(2, R)$?

9) Suppose that f is a homomorphism from Z_{30} to Z_{30} and $\text{Ker } f = \{0, 10, 20\}$. If $f(23) = 9$, determine all elements that map to 9.

10) What is the order of the factor group $\frac{Z_{60}}{\langle 5 \rangle}$?

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Unit-IV

1) Show that the sets $(Z(\sqrt{2}), +, \cdot), (Q(\sqrt{2}), +, \cdot), (Z[i], +, \cdot), (C, +, \cdot)$ are Rings.

2) The set of Real Continuous functions defined on $(0, 1)$ with respect to Addition and Multiplication of functions. Is a Ring

3) The set of 2×2 matrices is of the form $\begin{bmatrix} a & b \\ -\bar{b} & \bar{a} \end{bmatrix}$ is forms a ring with

respect

to matrix addition and matrix multiplication.

4) The set of all the real polynomials forms a Ring with respect to the addition and multiplication of Polynomials.

5) Find the zero divisors, and units of rings

$(Z_6, +_6, \times_6), (Z_7, +_7, \times_7), (Z_{12}, +_{12}, \times_{12}), (Z_{20}, +_{20}, \times_{20}), (Z_p, +_p, \times_p)$

6) Which of the following sets

$$(i) U = \left\{ A = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix} / a, b \in R \right\}$$

$$7) I = \left\{ A = \begin{bmatrix} a & b \\ 0 & 0 \end{bmatrix} / a, b \in R \right\}, (iii) I = \left\{ A = \begin{bmatrix} a & 0 \\ b & 0 \end{bmatrix} / a, b \in R \right\}$$

$$8) U = \left\{ A = \begin{bmatrix} a & b \\ c & 0 \end{bmatrix} / a, b \in R \right\},$$

$$9) U = \left\{ A = \begin{bmatrix} a & b \\ 0 & c \end{bmatrix} / a, b \in R \right\} \text{ are Sub rings or ideals of the Ring of all}$$

2×2 real matrices.

10) Find the Principal ideals, Prime ideals and maximal ideals of the rings

$(Z_6, +_6, \times_6), (Z_7, +_7, \times_7), (Z_{12}, +_{12}, \times_{12}), (Z_{20}, +_{20}, \times_{20})$.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER – III

Course Code: 3P1B	Number of Credits- 01
Title of the Course : Biology Practical	Total Instruction hours - 30 per Semester

Biochemistry Lab

1. Extraction of starch from Potato and its identification
2. Qualitative analysis of sugars
3. Qualitative analysis of Amino acids
4. Qualitative analysis of Lipids
5. Quantitative estimation of proteins by Biuret method
6. Estimation of RNA by Orcinol method
7. Separation and identification of amino acids by chromatography

Reference Books

1. Deshpandey and Shashidhar: Lab Manual.
2. Plummer: Lab Manual.
3. Sahney: Biochemistry Lab Manual

Kiranchan
M. G. V.
40
K. R. Reddy
H. S. S. S.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER – III

Course Code: 3P2	Number of Credits- 01
Title of the Course: Computer Science Practical	Total Instruction hours - 30 per Semester

A) SQL

1. Creation and Modification of tables
2. Retrieving data from a table
3. Sorting, Grouping, Using aggregate functions on a table
4. Join, Set Operations, Sub-queries of tables
5. Updating, Deleting, Dropping of table.

B) PL/SQL

1. Programming Language Basics
2. SQL and control structures in PL/SQL
3. Producers, Functions, Packages and Triggers
4. Controls and Exceptions
5. Records and Tables, Composite data Types.

Reference Book:

Database systems using grade – Nilesh Shah (PHI – 2002)

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER – III

Course Code: 3P3	Number of Credits- 01
Title of the Course : Physics Practical	Total Instruction hours - 30 per Semester

Electricity & Magnetism Lab

1. Determination of M and H – Vibration Magnetometer
2. Magnetic Field along the axis of a coil carrying current – Stewart and Gee's Galvanometer
3. Hysteresis Loop – Magnetometer Method (or) I-H Curve
4. Carey Foster's Bridge
5. Potentiometer – Comparison of Low Resistances
6. Constant 'K' of a Ballistic Galvanometer by using Standard Condenser
7. Verification of Logic gates AND, OR, NOT, X-OR and NAND gates
8. Verification of De-Morgan's Laws
9. R.C. Coupled Amplifier
10. Determination of ac-frequency-sonometer.
11. CR or RC circuit (Frequency response i.e. as a High or a Low Pass Filter)
12. RC circuit (Charging & Discharging of a Capacitor)
13. LCR circuit (Frequency response)

Note: Minimum of eight experiments should be performed.

Suggested Text Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (VaniPublishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (PragatiPrakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, AnchalSrivastava
5. B.Sc Practical Physics, C L Arora- S Chand & Co.
6. A text book of practical physics, M.N. Srinivasan, Chand & Co
7. Practical physics, M. Arul Thakpathi, Complete publishers
8. Via voce in advanced physics, R C Gupta, and P N Saxena, PragathiPrakashan, Meerut

**DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER – III**

Course Code: 3P4	Number of Credits- 01
Title of the Course : Chemistry Practical	Total Instruction hours - 30 per Semester

Practicals: Synthesis of Organic Compounds

1. Acetylation of Salicylic acid, Aniline, Benzoylation of Aniline and Phenol
2. Aromatic electrophilic substitution, Nitration: Preparation of nitro benzene and o-nitro acetanilide. Halogenation: Preparation of p-bromo acetanilide preparation of 2,4,6-tribromo phenol
3. Diazotization and Coupling: Preparation of Phenyl azo β -naphthol
4. Oxidation: Preparation of benzoic acid from benzyl chloride
5. Esterification: Preparation of methyl p-nitro benzoate from p-nitro benzoic acid
6. Methylation: Preparation of β -naphthyl methyl ether
7. Condensation: Preparation of benzilidene aniline

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
III	40	10	40	10

No. of Papers: Theory 6 Marks: 6 x 50 = 300
 Practical 4 4 x 50 = 200

Total Marks: 500

K. V. Narasimha *APV* *Abhishek* *Chandrasekhar* *Shravan*
oslojgen m. G. V. *K. R. Reddy* *Abhishek*
PSW

SEMESTER – IV

Course Code: 4T1	Number of Credits- 04
Title of the Course : English	Total Instruction hours - 60 per Semester

UNIT I:

12 h

Poem: "The Flower" *Alfred Tennyson*, Prose: "The Kitemaker" *Ruskin Bond*

Vocabulary: Commonly Confused Words, Grammar: Determiners

UNIT II:

12 h

Poem: "Ecology" *AK Ramanujan*, Prose: What's the Language of the Future? *Henry*

Hitchings, Vocabulary: Indianisms, Grammar: Framing Questions (Including Tag Questions)

UNIT III:

12 h

Poem: “Télévision” *Roald Dahl*, Prose: “The Fringe Benefits of Failure, and the Importance of Imagination” *JK Rowling*, Vocabulary: One-word Substitutes, Grammar: Relative Clauses

UNIT IV:

12 h

Review writing: Film Review, Book Review, Vocabulary: Technical Vocabulary (Film, Literature), Grammar: Conditionals

UNIT V:

12 h

CV Writing: Chronological CV, Functional CV, Vocabulary: Appropriacy Grammar: Common Errors

Prescribed Textbook for Semesters III & IV: *English in Use*. Eds. T Vijay Kumar, K DurgaBhavani, YL Srinivas. Published by Macmillan.

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PSW

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER – IV

Course Code: 4T2	Number of Credits- 04
Title of the Course : Telugu	Total Instruction hours - 60 per Semester

ప్రాచీన పద్యభాగం

15 h

1. నారద గానమాతృర్యం ... పింగళి సూరన
2. వాగ్దాన భంగం ... ఆసూరి మరింగంటి వేంకట నరసింహాచార్యులు
3. నారసింహ శతకం ... ధర్మపురి శేషప్ప

ఆధునిక పద్యభాగం

15 h

1. నరుడ నేను, నరుడ నేను ... కాళోజీ
2. అర్చగీతం ... దేవరకొండ బాలగంగాధర తిలక్
3. దేవరకొండ దుర్గం ... డా॥ ముకురాల రామారెడ్డి

వచన విభాగం

15 h

1. అర్ధరాత్రి అరుణోదయం ... దాశరథి రంగాచార్య
2. సి.పి.బ్రౌన్ సాహిత్య సేవ ... జానమద్ది హనుమచ్ఛాస్త్రి
3. మన గ్రామ నామాలు ... డా॥ కపిలవాయి లింగమూర్తి
4. నివురు తొలగిన నిప్పు ... పోల్కంపల్లి శాంతాదేవి
5. కొండమల్లెలు ... ఇల్లిందల సరస్వతీదేవి

ఛందస్సు

15 h

పాఠ్యగ్రంథము లోనివి

సామాజిక వ్యాసం

Reference: Telugu Academy Books

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER – IV

Course Code: 4T3A	Number of Credits- 04
Title of the Course : Mathematics	Total Instruction hours - 60 per Semester

Unit I: Limits and Continuity

15 h

Intervals and neighborhoods. Limits, Standard Limits, Continuity

Unit II: Differentiation

15 h

Derivative of a function. Elementary Properties. Trigonometric, Inverse Trigonometric, Hyperbolic, Inverse Hyperbolic Function – Derivatives, Methods of Differentiation, Second Order Derivatives.

Unit III: Integration

15 h

Integration as the inverse process of differentiation- Standard forms – properties of integrals. Method of substitution- integration of Algebraic, exponential, logarithmic, trigonometric and inverse trigonometric functions. Integration by parts.

Unit IV: Vectors

15 h

Classification of vectors, Addition of vectors, Scalar multiplication. Angle between two non-zero vectors, Linear combination of vectors. Component of a vector in three dimensions, Vector equations of line and plane including their, Cartesian equivalent forms.

References: Telugu Academy Books

**DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER – IV**

Course Code: 4T3B	Number of Credits- 04
Title of the Course : Biology	Total Instruction hours - 60 per Semester

Cell Biology and Molecular Biology

Unit-I

15 h

1. Ultra structure of cell, Differences of Prokaryotic and Eukaryotic cells
2. Structure and functions of Plasma membrane.
3. Structure and functions of cell organelles – Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, Centrosomes, Mitochondria and Nucleus

Unit-II

15 h

1. Chromosomes - Structure and types.
2. Cell Division - Mitosis, Meiosis.

Unit-III

15 h

1. DNA (Deoxyribo Nucleic Acid) – Structure and functions.
2. RNA (Ribo Nucleic Acid) Structure, types and functions.
3. DNA Replication.

Unit-IV

15 h

1. Protein Synthesis – Transcription and Translation
2. Gene Expression – Genetic Code; operation concept

References: 1. Sharma A. K. and A. Sharma 1999. Plant chromosomes analysis, Manipulation and Engineering. Harward Academic Publishers, Australia. 2. Shukla, R. S. and P. S. Chandel 2007, cytogenetics, Evolution, Biostatistics and Plant Breeding, S. Chand & company Ltd. New Delhi. 3. Singh, H. R. 2005. environmental Biology S. Chand & company Ltd. New Delhi. 4. Snustad, D. P. and M. J. Simmons 2000. Principles of Gentic. John Wiley and Sons, Inc. U S A 5. Stricberger, M. W. 1990. Genetics (3 rd Ed.) Macmillan Publishing Company

K. V. Venkatesh
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M. G. V.
K. P. Reddy
Abhishek
Shravan
Praveen

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER – IV

Course Code: 4T4	Number of Credits- 04
Title of the Course : Computer Science	Total Instruction hours - 60 per Semester

VISUAL PROGRAMMING

Unit- I: Introducing to Visual Basic

15 h

WORKING WITH WINDOWS AND FORMS : Creating the interface, Form events, Form methods, Properties of a form – THE VISUAL BASIC CONTROLS: Control Categories, The Form Designer, The label control, the text Box control, Command Buttons, Check Box Control, Option Box Controls, Arrays, Control arrays – OTHER CONTROLS: Horizontal and Vertical Scroll Box, Frames, List Boxes, Controls that work like Arrays, combobox - COMMON DIALOG BOX CONTROL: Drive List Box, Directory List Box, File list Box.

Unit-II:

15 h

CONCEPTS IN VISUAL BASIC 6: Even driven environments, Subroutines, Code Routines, Functions, Procedures, other module types- The input and Out-put, variables, controls and Maths, Branching and Decision, Looping and Iteration, Introduction to Visual basic, Arrays, Control Arrays and Procedures, Sub programmes.

INTRODUCTION AND PRINTING: The Debugger, Printing with windows, working with Dates, Times and Formats.

CREATING MENU STRUCTURE: The Menu Design window, Adding the menu bar, creating a Menu, Customizing a menu, creating a pop-up menu, Creating toolbar, adding buttons to toolbars, adding images to toolbars, adding pull-down menu.

Unit-III

15 h

GRAPHICS AND IMAGES AND PICTURES : ACTIVE X CONTROLS: Data bound active X controls, Using the animation control, Using the communication control.

Unit-IV: USING OLE CONTROL

15 h

HANDLING DATABASES: Creating database with Visual data Manager, Defining a Table, introducing crystal reports THE SCROLL BARS, GRID AND MOUSE

Reference Books:

1. Complete reference VB-6: Noel Jerke
2. VB-6 Gary Cornell (TMH)

Kiranchan *apj* *Nagpal* *Saleem* *Shanmugan*
mbanigan *M. G. K.* *K. K. Reddy* *Arjun Babu*
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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER – IV

Course Code: 4T5	Number of Credits- 04
Title of the Course : Physics	Total Instruction hours - 60 per Semester

Unit –I

15 h

Quantum Mechanics: Planck's theory of blackbody radiation; Photoelectric effect; Einstein's photoelectric theory; Compton effect (quantitative); wave particle duality; de-Broglie matter waves; electron diffraction; Davison and Germer Experiment, Heisenberg's uncertainty principle; Bohr's principle of correspondence.

Unit — II

15 h

Postulates of Quantum Mechanics: Schrodinger's wave equation, time – dependent, time-independent form, properties of wave function; preparation of wave functions; concept of stationary states. Applications of Schrodinger's equation: particle in a box, potential step, potential barrier and potential square well.

Unit – III

15 h

General properties of Atomic nucleus: Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, semi-empirical mass formula and binding energy. Quantum properties of nuclear states, particle groups, nuclear resonances, liquid drop model, shell model, collective model.

Unit – IV

15 h

Radioactivity: Stability of nucleus; Law of radioactive decay; Mean life & half-life; α decay; β decay - energy released, spectrum and Pauli's prediction of neutrino; γ -ray emission.

Fission and fusion: - Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions

Suggested text Books

1. Third year Physics, Telugu Academy
2. Quantum Mechanics: Mathews and Venkateshan P
3. Introduction to Quantum Mechanics: Pauling and Wilson.
4. Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
5. Modern Physics, John R.Taylor, Chris D.Zafiratos, Michael A.Dubson, 2009, PHI Learning
6. Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
7. Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.

Kirankumar *Arjun* *Narajit* *Chandrababu* *Shravan* *Abhishek*
Arjun *M. G. V.* *K. P. Reddy* *47*

8. Modern Physics, R.A. Serway, C.J. Moses, and C.A. Moyer, 2005, Cengage
9. Introduction to modern physics, Rictmyer, Kannard, Cooper, TMH edition.
10. Nuclear Physics: D C Tayal, Himalaya publishing house

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER – IV

Course Code: 4T6	Number of Credits- 04
Title of the Course : Chemistry	Total Instruction hours - 60 per Semester

Inorganic Chemistry

Unit-I: Chemistry of p-Block Elements-II

10 h

Carboranes: Closo – Nido- and Arachno carboranes, synthesis, structures and properties
 metallocarboranes: Synthesis, electron counting rules, structures and properties- Fullerenes:
 C₆₀, C₇₀ and brief discussion on other fullerenes, preparation of fullerenes, structure of the
 fullerenes, Chemistry of fullerenes – hydrogenation, oxidation, reduction, addition
 reactions, encapsulation of metal atoms – oxoacids of nitrogen, phosphorus, sulphur and
 chlorine.

Unit-II : Hard and Soft acids and bases rule and non-aqueous solvents

10 h

- a) Hard and soft acids and bases (HSAB) rule – classification of metals and ligands as class
 'a' and class 'b'. Pearson's concept of hard and soft acids and bases, applications of
 HSAB rule – predicting feasibility of a reaction and stability of compounds.
- b) Non-aqueous solvents – classification and characteristics of solvents, liquid NH₃ and
 liquid SO₂ as solvents, autoionization, reactions in liquid NH₃ and liquid SO₂ –
 neutralization precipitation, redox, complex formation and salvation reactions.

Organic Chemistry

Unit-III: Heterocyclic Compounds

10 h

Introduction and definition: simple 5 membered ring compounds with one hetero atom Ex.
 Furan, Thiophene and Pyrrole. Importance of ring systems - presence in important natural
 products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letters
 and numbers. Aromatic character 6-electron system (four electrons from two double bonds
 and a pair of non bonded electrons from the hetero atom). Tendency to undergo substitution
 reactions.

Resonance structures: Indicating electron surplus carbons and electron deficient hetero atom,
 explanation of feebly acidic character of pyrrole, electrophilic substitution at 2 or 5 position
 halogenation, nitration and sulphonation under mild conditions. Reactivity of furan as
 1,3diene, Diels-Alder reaction (one example). Sulphonation of thiophene (purification of
 Benzene obtained from coal tar). Preparation of furan, pyrrole and thiophene from 1, 4-
 dicarbonyl compounds only. Pual-Knorr synthesis. Structure of pyridine, basicity –
 aromaticity-comparison with pyrrole – one method of preparation, properties – reactivity
 towards nucleophilic substitution reactions- chichibabin reaction. Preparation and chemistry
 of indole, quinoline, isoquinolinecoumarins.

Unit-IV: Amino acids and proteins

10 h

Definition of amino acids, classification of amino acids into alpha, beta and gama amino
 acids. Natural and essential amino acids – definition and examples, classification of alpha

General methods of synthesis of alpha amino acids (specific examples – glycine, alanine, valine and leucine) by following methods (a) From halogenated carboxylic acid (b) Malonic ester synthesis (c) Strecker's synthesis. Physical properties: L-configuration of natural amino acids. Zwitter ion structure-salt like character, solubility, melting points, amphoteric character, definition of isoelectric point, Chemical properties: General reactions due to amino and carboxyl groups-lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

Physical Chemistry

Unit-V: Electrochemistry-2

10 h

Electrochemical cells – reversible cells electromotive force and its measurements. Single electrode potential types of electrodes – gas, metal, metal ion, oxidation-reduction, metal-metal insoluble salt, amalgam electrodes. Electrode reactions. Nernst equation – standard electrode- reference electrode. Hydrogen electrode and calomel electrode potential – Electrochemical series and its significance – applications of emf measurements – potentiometric titrations (acid-base, redox and precipitation)- problems

Unit-IV: Phase Rule

10 h

Gibbs phase rule, explanation of terms involved, derivation- phase equilibria of one component systems. Water system, sulphur system, phase equilibria of two component systems – salt – water system (NaCl-H₂O), Freezing mixtures, Pb-Ag system simple eutectic mixture – desilverisation of lead.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER – IV

Course Code: 4P1A	Number of Credits- 01
Title of the Course : Maths Practical	Total Instruction hours - 30 per Semester

UNIT-I

$$f(x) = \begin{cases} 3, & \text{if } 0 \leq x \leq 1 \\ 4, & \text{if } 1 < x < 3 \\ 5, & \text{if } 3 \leq x \leq 10 \end{cases}$$

$$f(x) = \begin{cases} -2, & \text{if } x \leq -1 \\ 2x, & \text{if } -1 < x \leq 1 \\ 2, & \text{if } x > 1 \end{cases}$$

$$f(x) = \begin{cases} 2x, & \text{if } x < 0 \\ 0, & \text{if } 0 \leq x \leq 1 \\ 4x, & \text{if } x > 1 \end{cases}$$

Find the relationship between a and b so that the function f defined by

$$f(x) = \begin{cases} ax+1, & \text{if } x \leq 3 \\ bx+3, & \text{if } x > 3 \end{cases}$$

is continuous at $x = 3$.

Show that the function defined by $g(x) = x - [x]$ is discontinuous at all integral points. Here $[x]$ denotes the greatest integer less than or equal to x .

Kirankumar *apj* *Naraj* *Chellappan* *Shamshara*
msl *Sanjay* *Prasanna* *Abhishek*
49

Determine if f defined by

$$f(x) = \begin{cases} x^2 \sin \frac{1}{x}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$$

is a continuous function?

Examine the continuity of f , where f is defined by

$$f(x) = \begin{cases} \sin x - \cos x, & \text{if } x \neq 0 \\ -1, & \text{if } x = 0 \end{cases}$$

$$f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & \text{if } x \neq \frac{\pi}{2} \\ 3, & \text{if } x = \frac{\pi}{2} \end{cases} \quad \text{at } x = \frac{\pi}{2}$$

$$f(x) = \begin{cases} kx + 1, & \text{if } x \leq \pi \\ \cos x, & \text{if } x > \pi \end{cases} \quad \text{at } x = \pi$$

Show that the function defined by $f(x) = \cos(x^2)$ is a continuous function.

Show that the function defined by $f(x) = |\cos x|$ is a continuous function.

Examine that $\sin |x|$ is a continuous function.

Prove that the function f given by

$$f(x) = |x - 1|, x \in \mathbb{R}$$

is not differentiable at $x = 1$.

Prove that the greatest integer function defined by

$$f(x) = [x], 0 < x < 3$$

is not differentiable at $x = 1$ and $x = 2$.

UNIT-II

Find the derivative of the following functions from first principle.

(i) $x^3 - 27$

(ii) $(x-1)(x-2)$

(iii) $\frac{1}{x^2}$

(iv) $\frac{x+1}{x-1}$

For the function

$$f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \dots + \frac{x^2}{2} + x + 1.$$

Prove that $f'(1) = 100f'(0)$.

Handwritten signatures and names:
 Kivana, Anup, Narsimha, Sateesh, Ishwaryan, M. G. V., K. P. Reddy, Anurajaleha, R. B. V.

Find the derivative of $x^n + ax^{n-1} + a^2x^{n-2} + \dots + a^{n-1}x + a^n$ for some fixed real number a .

For some constants a and b , find the derivative of

(i) $(x-a)(x-b)$

(ii) $(ax^2 + b)^2$

(iii) $\frac{x-a}{x-b}$

Find the derivative of $\cos x$ from first principle.

$$\frac{px^2 + qx + r}{ax + b}$$

$$(ax + b)^n$$

$$(ax + b)^n (cx + d)^m$$

UNIT-III

$$(4x+2)\sqrt{x^2+x+1}$$

$$\frac{\sin^{-1}x}{\sqrt{1-x^2}}$$

$$\sqrt{\sin 2x} \cos 2x$$

$$\cot x \log \sin x$$

$$\frac{(1+\log x)^2}{x}$$

$$\int \frac{10x^9 + 10^x \log_e 10 \, dx}{x^{10} + 10^x} \text{ equals}$$

(A) $10^x - x^{10} + C$

(B) $10^x + x^{10} + C$

(C) $(10^x - x^{10})^{-1} + C$

(D) $\log(10^x + x^{10}) + C$

$$\int \frac{dx}{\sin^2 x \cos^2 x} \text{ equals}$$

(A) $\tan x + \cot x + C$

(B) $\tan x - \cot x + C$

(C) $\tan x \cot x + C$

(D) $\tan x - \cot 2x + C$

$$\sin^2(2x+5)$$

$$\sin 3x \cos 4x$$

$$\int \frac{e^x(1+x)}{\cos^2(e^x x)} dx \text{ equals}$$

(A) $-\cot(e^x) + C$

(B) $\tan(xe^x) + C$

(C) $\tan(e^x) + C$

(D) $\cot(e^x) + C$

UNIT-IV

Kiranika *Apurva* *Nagendra* *Chaitanya* *Shravan*
Indira *M. Gill* *51* *K. Reddy* *Arun Edla*
PLV

Show that the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $-4\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear.

Find the direction cosines of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$.

Find the direction cosines of the vector joining the points A (1, 2, -3) and B (-1, -2, 1), directed from A to B.

Find the angle between two vectors \vec{a} and \vec{b} with magnitudes $\sqrt{3}$ and 2, respectively having $\vec{a} \cdot \vec{b} = \sqrt{6}$.

Find the angle between the vectors $\hat{i} - 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$

Show that each of the given three vectors is a unit vector:

$$\frac{1}{7}(2\hat{i} + 3\hat{j} + 6\hat{k}), \frac{1}{7}(3\hat{i} - 6\hat{j} + 2\hat{k}), \frac{1}{7}(6\hat{i} + 2\hat{j} - 3\hat{k})$$

Also, show that they are mutually perpendicular to each other.

Find $|\vec{a} \times \vec{b}|$, if $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$.

Given that $\vec{a} \cdot \vec{b} = 0$ and $\vec{a} \times \vec{b} = \vec{0}$. What can you conclude about the vectors \vec{a} and \vec{b} ?

Let the vectors $\vec{a}, \vec{b}, \vec{c}$ be given as $a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$, $b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$, $c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$. Then show that $\vec{a} \times (\vec{b} + \vec{c}) = \vec{a} \times \vec{b} + \vec{a} \times \vec{c}$.

If either $\vec{a} = \vec{0}$ or $\vec{b} = \vec{0}$, then $\vec{a} \times \vec{b} = \vec{0}$. Is the converse true? Justify your answer with an example.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER - IV

Course Code: 4P1B	Number of Credits- 01
Title of the Course : Biology Practical	Total Instruction hours - 30 per Semester

Cell Biology

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies.
2. Study of various stages of mitosis using cytological preparation of Onion root tips.
3. Study of various stages of meiosis using cytological preparation of Onion flower buds.
4. Solving genetic problems related to monohybrid, dihybrid ratio incomplete dominance and interaction of genes (minimum of six problems in each topic).
5. Study of ultra-structure of cell organelles using photographers. Chloroplast, Mitochondria, Nucleus, Ribosomes, Endoplasmic reticulum, and Golgi complex.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER - IV

Course Code: 4P2	Number of Credits- 01
Title of the Course: Computer Science Practical	Total Instruction hours - 30 per Semester

Kiran *Apur* *N. G. V.* *52* *K. P. Reddy* *Aban Bha...*

Visual Programming

The lab is to be conducted on the basis of concepts covered in the corresponding theory paper.

SEMESTER – IV

Course Code: 4P3	Number of Credits- 01
Title of the Course : Physics	Total Instruction hours - 30 per Semester

1. To determine work function of material of filament of directly heated vacuum diode.
2. To determine value of Planck's constant using LEDs of at least 4 different colors.
3. To determine the ionization potential of mercury.
4. To determine the wavelength of H-alpha emission line of Hydrogen atom.
5. e/m of an electron by Thomson method
6. Characteristic of GM counter
7. Study of absorption of β and γ rays
8. Determination of Planck's constant
9. Characteristics of a solar cell
10. Characteristics of a photodiode

Note: Minimum of eight experiments should be performed

Suggested Text Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (VaniPublishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (PragatiPrakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, AnchalSrivastava
5. B.Sc Practical Physics, C L Arora- S Chand & Co.
6. A text book of practical physics, M.N. Srinivasan, Chand & Co
7. Practical physics, M. Arul Thakpathi, Complete publishers
8. Via voce in advanced physics, R C Gupta, and P N Saxena, PragathiPrakashan, Meerut
9. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia Publishing House.
10. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
11. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition, 2011, KitabMahal, New Delhi.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURUUNIVERSITY SEMESTER – IV

Course Code: 4P4	Number of Credits- 01
Title of the Course : Chemistry	Total Instruction hours - 30 per Semester

Practicals: Instrumental analysis

I. Properties of liquids

1. Measurement of density and viscosity of the given liquids
2. Measurement of density and surface tension
3. Measurement of refractive index

Kiran *Apur* *Neeraj* *Chand* *Ananya* *K.P. Reddy* *Arun Laksh*
Indu *M. N. Srinivasan* *M. Arul* *53* *Q.P.V.*

II. Conductometry

4. Determination of cell constant
5. Titration of strong acid with NaOH
6. Titration of weak acid with NaOH
7. Titration of strong acid with NtLiOH

III. Potentiometry

8. Determination of standard electrode potential (Cu/Cu^{2+} electrode)
9. Titration of strong acid with NaOH
10. Titration of weak acid with NaOH

Recommended Textbooks and Reference Books

Inorganic Chemistry:

1. Principles of inorganic chemistry by B.R. Puri, L.R. Sharma and K.C. Kalia
2. Concise Inorganic Chemistry, by J.D Lee
3. Basic Inorganic Chemistry by Cotton and Wilkinson
4. Advanced Inorganic chemistry, Vol. I, II by Satyaprakash, Tuli, Basu and Madan
5. Concepts and Models of Inorganic Chemistry by P E Douglas and T H McDaniel
6. Inorganic Chemistry by R R Heslop and P L Rohinson
7. Modern Inorganic Chemistry by C F Bell and K A Lott
8. University Chemistry by Bruce Mahan
9. Qualitative Inorganic analysis by A I Vogel
10. A textbook of quantitative inorganic analysis by A I Vogel
11. Inorganic Chemistry by J E Huheey
12. Coordination Chemistry by Basalo and Johnson
13. Organometallic chemistry – An introduction by R C Mehrotra and A Singh
14. Inorganic Chemistry by D F Shriver, P W Atkins and C H Langford
15. Inorganic Chemistry by Phillips and Williams, Lab Manuals
16. Introduction to inorganic reaction mechanisms by A C Lockhart
17. Theoretical Inorganic Chemistry by Mc Day and J Selbin
18. Chemical bonding and molecular geometry by R J Gillespy and P L Popelier

Organic Chemistry

1. Organic Chemistry by R T Morrison and R N Boyd
2. Organic Chemistry by T J Solmons
3. Organic Chemistry by L G Wade Sr
4. Organic Chemistry by D J Cram, G S Hammond and Hendricks
5. Modern Organic Chemistry by J D Roberts and M C Caserio
6. Textbook of organic chemistry by Ferguson

7. Problems and their solution in organic chemistry by I L Finar
8. Reaction mechanisms in organic Chemistry by SM Mikherji and SP Singh
9. A guidebook to mechanisms in Organic Chemistry by Peter Sykes
10. Heterocyclic chemistry by Gilchrist
11. Heterocyclic Chemistry by R K Bansal

Physical Chemistry

1. Physical Chemistry by G M Barrow
2. Principles of Physical Chemistry by Prutton and Marron
3. Theoretical Chemistry by L S Glasstone
4. Textbook of Physical Chemistry by K L Kapoor
5. Thermodynamics for Chemists by S Glasston
6. Chemical Kinetics by K J Laidler
7. Kinetics and Mechanism by J W Moore and R G Pearson
8. Physical Chemistry through problems by S K Dogra
9. An introduction to electrochemistry by S Glasston
10. Fundamentals of Photochemistry by K K Rohtagi and Mukherjee
11. Solid State Chemistry by N B Henry
12. Chemical Thermodynamics by R P Rastogi and S S Misra
13. Thermodynamics by J Jayaaram and J C Kuriakos
14. Introductory Quantum Chemistry by A K Chandra
15. Introduction to Collid Chemistry by Mysels

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
IV	40	10	40	10

No. of Papers: Theory 6 Marks: 6 x 50 = 300
 Practical 4 4 x 50 = 200

Total Marks: 500

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mb *M. Hill* *K. P. Reddy* *Arun Salika*
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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-V

Course Code: 5-T1	Number of Credits- 03
Title of the Course: Statistics	Total Instruction Hours- 45 per Semester

Unit – I

15 h

Classification, Tabulation and Graphical representation of data, Frequency polygon, Histogram and ogives, various measures of central tendency: Arithmetic Mean, Median Mode, Geometric Mean, Harmonic Mean, Various Measures of Dispersion: Range, Quartile Deviation, Standard Deviation, Coefficient of variation, moments, skewness and kurtosis, Correlation coefficient and its properties, simple examples.

Unit-II

15 h

Mathematical, Statistical and Axiomatic definitions of probability, addition and multiplicative theorems, mutually exclusive, Dependent and Independent events, Conditional Probability, Baye's Theorem with simple examples. Concepts of random variables, discrete and continuous random variables, theorems on expectation of their sum and product, probability mass function, probability density function, cumulative distribution function and their properties: Simple examples

Unit-III:

15 h

Definitions, pmf/pdf's, Mean, Mode, Mean deviation about mean, first four moments, Skewness, Kurtosis, Additive property, Moment Generating function, Characteristics function, Recurrence relations of Bernoulli, Binomial, Poisson, Uniform and Normal Distributions with simple examples

Recommended Books:

1. Fundamentals of Mathematical statistics: S.C. Gupta & V.K. Kapoor (Sulthan Chand & Sons, New Delhi)
2. Mathematical Statistics: J.K. Goyal and J.N. Sharma (Krishna Prakashan Media (P) Ltd., Meerut)

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-V

Course Code: 5-T2	Number of Credits- 03
Title of the Course: General Chemistry	Total Instruction Hours- 45 per Semester

Unit-I: Chromatography and Ion-Exchange techniques

15 h

A) Chromatographic Methods: Principles of separation and classification of Chromatographic methods. Paper Chromatography: Definition, Principles and Applications of paper chromatography: thin layer chromatography: Definition, mechanisms, efficiency of TLC plates, selection of stationary and mobile phases: Gas Chromatography- Instrumentation: Carrier gas, Columns and stationary phases and detectors used in GC, Some qualitative and quantitative applications of GC: analysis of Chlorinated pesticides in water and trihalomethanes in drinking water, High Performance liquid chromatography – Instrumentation: Columns, Stationary phases, mobile phases and detectors used in GC, some qualitative applications of HPLC: Determination of aspirin, Phenacetin and Caffeine in

mixture, Determination of Fluoxetine in serum: GC-MS and LC-MS: techniques and applications

B) Ion-Exchange Methods: General discussion, Typical synthetic cation and anion exchange resins. Action of Ion exchange resins. Ion-exchange equilibria, Ion-exchange capacity, Determination of cation and anion exchange capacity, column operation and ion exchange chromatography, separation of Zn and Mg using anion exchange resin, Determination of total cation concentration in water.

Unit-II: Atomic Absorption, Atomic emission and ICP –AES methods of analysis 15 h

Atomic Absorption Spectroscopy (AAS): Principles of AAS, instrumentation-flame AAS and furnace AAS, resonance line sources, sensitivity and detection limits in AAS, interference-chemical and spectral, evaluation methods in AAS and application in qualitative and quantitative analysis

Atomic Emission Spectroscopy (AES): Principles of AES, instrumentation, evaluation methods, application in quantitative analysis

Inductively coupled Plasma-Atomic emission spectroscopy (ICP-AES): Limitations of AES, principles of plasma spectroscopy, plasma an excitation source, inductively coupled plasma source, ICP-AES-instrumentation. Applications of ICP-AES, comparison with AAS

Unit-III: Thermal methods of Analysis & Solvent Extraction methods 15 h

A) Thermal methods of Analysis: Principles, Instrumentation, Comparison and Interpretation of TGA and DTG curves, TGA curves of mixtures, Factors affecting TGA curves, Applications of TGA. Differential Thermal analysis and Differential Scanning Calorimetry – Principles, Instrumentation and quantitative aspects of DTA and DSC curves: Interpretation of DTA and DSC curves. Influence of atmosphere on DTA curves of a sample, complementary nature of TGA and DTA applications of DTA and DSC.

B) Solvent Extraction Methods: Principles, Liquid-Liquid systems, Factors favoring solvent extraction, some practical considerations in solvent extraction, Determination of Ni as (Ni(DMG₂)) and Pb by dithizone method, solid-liquid system.

Reference books:

1. Vogel's Text book of Quantitative Chemical Analysis: G.H. Jeffery et al. Addison Wesley Longman.
2. Dean's Analytical Chemistry Hand Book: McGraw Hill
3. Modern Analytical Chemistry: David Harvey: McGraw Hill
4. Principles and Practice of Analytical Chemistry: F.W Fifield & D. Kealey, Blackwell Science
5. Instrumental Methods of Analysis Willard Dean & Settle, Backwell Science Ltd. Lo
6. Automatic Methods of Analysis, M.Valcarcel, M .D. Luque de castro, Elsevier, Vol.p
7. Principle of Instrumental Analysis, Skoog, Holler and Wieman, Harcourt Asia.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-V

Course Code: 5-T3	Number of Credits- 03
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 45 per Semester

Unit – I: Coordination compounds

15 h

Nomenclature of coordination compounds

Theories of metal-ligand bond: Werner theory and limitations, sedziwick theory and EAN concept, Valence bond theory – Geometries of coordination numbers 4-tetrahedral and square planar and 6-octohedral. Limitations.

Isomerism in coordination compounds – Phenomenon of isomerism. Types of isomerism i) structural isomerism – Ionization, hydrate, linkage, coordination, coordination position and polymerization isomerism and ii) stereoisomerism – Geometrical and optical isomerism.

Unit-II: Coordination Chemistry-II Bonding theories of metal complexes

15 h

Crystal field theory: Salient features, splitting of metal orbitals in regular and distorted octahedral square planar, tetrahedral, square Pyramidal and trigonal bipyramidal geometries, measurement of crystal field splitting energy, High spin and low spin octahedral complexes. Crystal field stabilization energy factors affecting the magnitude of crystal field splitting. Jahn Teller distortion. Applications and limitations of crystal field theory. Molecular orbital theory: Nephelauxetic effect, Molecular orbital diagrams of octahedral, tetrahedral and square planar complexes. Molecular orbital treatment of π bonding in complexes.

Unit –III: Chemistry of p-Block Elements-III

15 h

Oxygen: Chemistry and stereochemistry of oxygen, single oxygen, ozone- Halogens: Interhalogen compounds – Diatomic and tetraatomic interhalogen compounds – structures and properties, Pseudohalogens- Charge transfer complexes of halogens – zero group elements – General chemistry: Compounds of Xenon- Preparation and Structures Zintl anions and Zintl compounds.

Ref. Books: 1. Inorganic Chemistry by Shriver & Atkins and by J E Huhey. 2. Chemistry of elements by Green & Underwood 3. Advance Inorganic Chemistry by F. A. Cotton & G. J. Wilkinson

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-V

Unit-I: Carbohydrates

15 h

Course Code: 5-T4	Number of Credits- 03
Title of the Course: Organic Chemistry	Total Instruction Hours- 45 per Semester

General reactions of monosaccharides, configurational studies on glucose and fructose, structure determination and synthesis of sucrose, maltose and cellulose, chemistry of glycogen, cellulose and starch.

Unit-II: Reaction mechanism-I

15 h

Investigation of reaction mechanisms: kinetics, isotopes, study of intermediates and product analyses-study of reaction intermediates: formation and stability of carbonium ions, carbanions, carbenes, nitrenes, free radicals and arynes-mechanism in aromatic nucleophilic substitutions: S_NAr , Benzyne mechanisms-elimination reactions: various types of eliminations and their mechanistic pathways, orientation in eliminations, eliminations vs substitutions – study of nucleophilic substitution with specific reference to the neighboring

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molecules. Sackore - Tetode equation of entropy. Equilibrium constant.
 Kuran. Apy. Nossyn. Gredalt. ~~Srayan~~
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Quantum Statistics – Basic concepts of quantum statistics – Bose-Einstein and Fermi-Dirac statistics comparison with Maxwell- Boltzmann statistics.

Unit-III: Photochemistry & Solid State

15 h

Photochemistry: Introduction – absorption laws – Lambert Beer's law, laws of photochemistry: Grothus-Draper law. Stark-Einstein law, Quantum yield. Photochemical reactions of hydrogen-chlorine and hydrogen-bromine. Photochemical Processes – Jablonski diagram. Radiative, Non-radiative processes, fluorescence, Phosphorescence, internal conversion, intersystem crossing, photosensitized reactions- energy transfer process.

Solid State: Laws of crystallography. i) Law of constancy of interfacial angles ii) Law of symmetry, Symmetry elements in crystals iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais Lattices and Seven crystal systems. X-ray diffraction by crystals: Derivation of Bragg's equation, Determination of structure of NaCl (Bragg's method and powder method). Defects in crystals: Stoichiometric and Non- Stoichiometric defects. Band theory of Semiconductors: Extrinsic and Intrinsic semiconductors, n-type and p-type and their applications in photo-electro chemical cells.

Recommended books:

1. Chemical Kinetics by K.J. Laidler, Tata McGraw-Hill Publishing company Ltd.
2. Chemical Kinetic Methods, Principles of Relaxation Techniques & applications by C. Kalidas.
3. Advanced Physical Chemistry by Gurdeep Raj. Goel Publishing House, Meerut.
4. Fundamentals of Photochemistry by K.K. Rohatgi-Mukherjee, Wiley Eastern Ltd.
5. Atomic Structure & Chemical Bond by Manas Chanda, Tata McGraw-Hill Publishing Co. Ltd.
6. Principles of Chemistry by Paul Andersen & Anthony J. Sonnessa
7. Solid State Chemistry by D.K. Chakravarty
8. Solid State Chemistry and applications by A.R. West, Penum Press
9. Solid State Physics by S. Pillay, New age Publishers.
10. Text book of Advanced Physical Chemistry by Puri & Sharma.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER-V

Course Code: 5-P1	Number of Credits- 02
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

Preparation and characterization of some inorganic and coordination compounds

1. Preparation of $\{\text{Cu}(\text{NH}_3)_4\}\text{SO}_4 \cdot \text{H}_2\text{O}$

2. Preparation of $\{\text{Ni}(\text{DMG})_2\}$

3. Preparation of $\{\text{Mn}(\text{acac})_3\}$

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4. Preparation of $\text{Na}\{\text{Cr}(\text{NH}_3)_2(\text{SCN})_4\}$
5. Preparation of linkage isomers $\{\text{Co}(\text{NO}_3)(\text{NH}_3)_5\}$ and $\{\text{Co}(\text{ONO})(\text{NH}_3)_5\}$
6. Preparation of basic lead chromate- PbCrO_4 , PbO

II. EDTA back-titrations:

- (i) Estimation of Ni^{2+} . (ii) Estimation of Al^{3+} .

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-V

Course Code: 5-P2	Number of Credits- 02
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester

Practicals: Two-Stage Preparation. Preparation of

- i) Benzanilide by Beckmann's rearrangement:
 - a) Preparation of benzophenoneoxime
 - b) Beckmann's rearrangement to benzanilide
- ii) Benzylic acid from benzoin
 - a) benzyl form benzoin
 - b) benzoic acid from benzyl
- iii) Anthranilic acid from phthalic anhydride
 - a) phthalimide from phthalic anhydride
 - b) Hoffmann's rearrangement to anthranilic acid
- iv) o-Chloro Benzoic acid from Anthranilic acid
- v) Tri bromo benzene from Aniline

Recommended Books:

1. Text book of Practical Organic Chemistry - Vogel

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-V

Course Code: 5-P3	Number of Credits- 02
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

1. Kinetics of acid catalyzed acetone – Iodine reaction (Comparison of rate constants at different acid concentration)
2. Kinetics of acid catalyzed hydrolysis of methyl acetate (Comparison of rate constants at different acid concentration)
3. Potentiometric titration of strong acid Vs Strong base
4. Conductometric titration of strong acid Vs strong base
5. Colorimetry: Verification of Lambert-Beer's law and Determination of molar extinction coefficient of KMnO_4 , CuSO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$ and $\text{Cu}(\text{NH}_4)_6\text{SO}_4$

6. Verification of Freundlich Adsorption isotherm: Acetic acid – activated charcoal.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-V

Course Code: 5-P4	Number of Credits- 02
Title of the Course: General Chemistry	Total Instruction Hours- 60 per Semester

- I. EDTA substitution titrations
- II. Estimation of Ca^{2+}
- III. Conductometric titration of strong acid Vs strong base
- IV. Conductometric titration of weak acid Vs strong base

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
V	50	10	40	10

No. of Papers:	Theory	5	Marks: $5 \times 60 = 300$
	Practical	4	$4 \times 50 = 200$
	Seminar	1	$1 \times 50 = 50$

Total Marks: 550

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-VI

Course Code: 6-T1	Number of Credits- 03
Title of the Course: Pharmacology	Total Instruction Hours- 45 per Semester

Unit-I: General Pharmacology

15 h

Introduction to pharmacology: Definition of drug: Pharmacology affinity: Agonist and antagonist receptors and efficacy: sources of drugs: Dosage forms: Routes of administration, Mechanism of drug action: Combined effect of drugs: Factors modifying drug action: Tolerance and dependence: Pharmacogenetics- Adsorption, distribution and excretion of drugs.

Unit-II: Drugs acting on Nervous System

15 h

Pharmacology of drugs acting on autonomic nervous system- i) Neurohumoral transmission: ii) Parasympathomimetics, parasympatholytics, Sympathomimetics and Sympatholytics

components of a mixture, ionization constants of acids and bases. Woodward- Fieser rules for calculating absorption maximum in dienes, trienes and α , β -unsaturated carbonyl compounds. Charge transfer spectra of complexes. Photometric titrations: Determination of composition of complexes by job's slope ratio method: UV spectra of Mesityl Oxide, Phenol and Benzoic acid.

Recommended Books:

1. Chemical applications of group Theory- F.A. Cotton
2. Atomic structure and Chemical Bonding – Manas Chanda (Tata Mc Graw-Hill)
3. Fundamentals of molecular spectroscopy – Banwell & McCash (Tata McGraw-Hill)
4. Molecular Spectroscopy – Patel and Patel (Sardar Patel University Press)
5. Spectroscopy Organic Compounds- P.S. Kalsi (New Age International)
6. Organic Spectroscopy – Jag Mohan (Narosa)
7. Elementary Organic Spectroscopy – Y.R. Sharma (S.Chand & Company)
8. Molecular Spectroscopy – W.Kemp (ELBS)
9. Instrumental Methods of Chemical analysis – G.R. Chatwal & S.K. Anand (Himalaya)
10. Symmetry and Spectroscopy of molecules – K.Veerareddy, New age International Publications (P) Ltd., New Delhi (1998)
11. Spectrometric identification of Organic Compounds, 6th ed. Rober M.Silverstein & Francis Webster
12. Application of Spectroscopy – J.Dyer.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURUUNIVERSITY SEMESTER-VI

Course Code: 6-T3	Number of Credits- 03
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 45 per Semester

Unit-I: Coordination Chemistry-III Metal-Ligand equilibria in solution 15 h

Stability of binary metal complexes-thermodynamic stability and kinetic stability. Concentration thermodynamic and conditional constants, stepwise stability constants. Trends in stepwise stability constants. Factors influencing the stability of metal complexes with reference to metal and the . Chelate effect and its thermodynamic origin. Macrocyclic effect of crown ethers and . HSAB rule and its thermodynamic to stability of complexes and metal-ligand interaction in the biological systems. Determination of stability constants of metal complexes. Spectrophotometric and potentiometric methods.

Unit-II: Coordination Chemistry-IV Electronic Spectra of metal complexes 15 h

Three ion terms: Electron configuration, Microstates and terms. Calculation of microstates for p- and d-configurations. Russel- Saunders (L-S) coupling. Derivation of terms for p² and d² configurations. Terms for d configurations. Hole formalism. Hund's rules to determine ordering of energy levels. Effect of weak fields on free ion terms. Selection rules-spin selection rule and selection rule. Breakdown of selection rules. Orgel diagrams for d1 to d9 systems. Electronic spectra of $(\text{Ti}(\text{H}_2\text{O})_6)^{3+}$, $(\text{Cu}(\text{H}_2\text{O})_6)^{2+}$, $(\text{V}(\text{H}_2\text{O})_6)^{3+}$, (CoCl_4) ,

(NiCl₄)²⁻, (CoF₆)³⁺ and Co(NH₃)₆³⁺ Complexes. Calculation of ligand field parameters-B, β and IO DQ. Tanabe-Sugano diagrams for d² and d⁶ octahedral systems. Charge transfer spectra.

Unit-III: Magnetic Chemistry

15 h

Types of magnetism: Para, dia, ferro and antiferro-magnetism. Temperature independent paramagnetism. Behaviour of para, dia, ferro and antiferro- magnetic substances with temperature. Magnetic susceptibility measurement. Gouy method and Faraday method. Magnetic properties of metal ions-spin moment and orbital moment. Orbital contribution to magnetic spin orbit coupling. Quenching of orbital angular momentum by ligand fields.

Reference Books:

1. Inorganic chemistry J.E. Huheey, E.A. Keiter and R.L. Keiter. 4th ed., Harper Collins College Publishers.
2. Advanced Inorganic Chemistry F.A. Cotton and G. Wilkinson, ed., Wiley Interscience
3. Inorganic Chemistry D.F. Shriver and P.W. Atkins, 3rd ed., Oxford
4. Concise Inorganic Chemistry J.D. Lee, Blackwell Science
5. Coordination Chemistry F. Basolo and R. Johnson, Benjamin Inc.
6. Concepts and models of Inorganic Chemistry B.E. Douglas, D.H. McDaniel and J.J. Alexander, 3 ed., John-Wiley.
7. Chemistry of complex equilibria M.T. Beck von Nostrand Reinhold
8. Metal Complexes in aqueous solutions A.E. Martell and R.D. Hancock Plenum Press
9. Inorganic Chemistry K.F. Purcell and J.C. Kotz Holt-Saunders International editions.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER-VI

Course Code: 6-T4	Number of Credits- 03
Title of the Course: Organic Chemistry	Total Instruction Hours- 45 per Semester

Unit-I: Stereochemistry-I

15 h

Molecular symmetry in organic molecules: Symmetry elements (C_n, C_i & S_n) and symmetry operations- configuration-R,S nomenclature: E, Z nomenclature for unsaturated systems, Re and Si faces, Prochirality-Racemization and racemic modifications – Resolution of racemic modifications-Principles of chemical reactivity: kinetic control and thermodynamic control-partial and absolute asymmetric synthesis- introduction to stereo selective synthesis-stereochemistry of nitrogen compounds with a tetra co-ordinate chiral center – Stereochemistry of nitrogen compounds containing C=N- and – N=N: Concept of dynamic enantiomerism and Atropisomerism – Conformational analysis of mono and di substituted cyclohexanes.

Unit-II: Chemistry of Polypeptides and proteins

15 h

Determination of structure of polypeptides: N-terminal and C-terminal amino acids determination – sequence determination in polypeptides: General methods of synthesis of polypeptide synthesis: Solid phase peptide synthesis: Chemistry of oxytocin and Insulin, distribution of proteins in nature. Classification of proteins. Isolation and purification – secondary and tertiary structures of proteins.

Unit-III: Non-Benzenoid aromatic compounds**15 h**

Concept of aromaticity, Robinson's sextet theory-Huckels rule, basis for the rule, limitations of rule, various non-benzenoid aromatic molecules, $4n+2$ electrons: Synthesis and properties of aromatic 3,4,5,6,7,8 membered rings, Metallocenes: Annulenes – Ring current, Azulenes, Syndnones, Anti-aromatic compounds, Alternate and non-alternate hydrocarbons.

Recommended Books:

1. Stereo Chemistry of Carbon Compounds - Eliel
2. Stereo Chemistry of Organic Compounds – D. Nasipuri
3. The Proteins – Academic Press(1963)- Neurath
4. Organic Chemistry, Volumes I and II I.L Finar
5. Alicyclic compounds – Llyod
6. Modern text book of Organic Chemistry – Furguson

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VI

Course Code: 6-T5	Number of Credits- 03
Title of the Course: Physical Chemistry	Total Instruction Hours- 45 per Semester

Unit-I: Thermodynamic – II**15 h**

Second law of thermodynamics, Need for the second law. Different statement of the law. Carnot cycle and its efficiency carnot theorem. Thermodynamic scale of temperature. Concept of entropy, enthalpy as a state function. Entropy as a state function of volume and temperature, and pressure and temperature. Entropy change in physical processes. Free energy – Gibbs function(G) Helmholtz function (A) as thermodynamic quantities. A & G as criteria for thermodynamic equilibrium and spontaneity – their advantage over entropy. Variation of free energy with temperature and pressure. Clausius- Clapeyron equation. Maxwell's relationships. Van't Hoff's isotherm and isochroe equations. Third law of thermodynamics- Calculation of absolute entropies of solids liquids and gases. Validity of the third of law.

Unit-II: Chemical Kinetics-II**15 h**

Lindamann's theory of unimolecular reactions and Hinshelhood modification. Termolecular reactions – examples. Explosive reactions, chain reactions, oscillating reactions. Linear free energy relationship – Hammett and Taft's equations. Solvent and ionic strength effects on rates of ion-ion and ion-dipole reactions. Isotope effect on reaction rates – substrate and solvent isotope effect.

Kinetics of fast reactions: flow methods- stopped flow and continuous flow. Relaxation - methods – relaxation time and its relation to rate constant. Temperature jump and pressure jump methods. Photolysis

Unit-III: Non-equilibrium Thermodynamics**15 h**

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Thermodynamic criteria for non –equilibrium states – entropy production and entropy flow, entropy balance, equations for different irreversible processes like heat flow, material flow and chemical reactions. Transformations of the generalized fluxes and forces, non – equilibrium stationary states, Phenomenological equations, microscopic reversibility and onsagar's reciprocity relations. Irreversible thermodynamics as applied to biological systems and coupled reactions.

Recommended Books:

1. Principles of Physical Chemistry by S.H. Maron & C.F. Prutton, MacMillan Company
2. Thermodynamics by Samuel Glasstone by D.Van Nostrand Company Inc.
3. Text book of Advance Physical Chemistry by Puri & Sharma
4. Advanced Physical Chemistry by Guru & Singh, Pragathi Prakasan Publishers.
5. Chemical Kinetics by K.J. Laidler, Tata McGraw-Hill Publishing company ltd.
6. Chemical Kinetic Methods, Principles of Relaxation Techniques & applications by C.Kalidas.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURUUNIVERSITY SEMESTER-VI

Course Code: 6-P1	Number of Credits- 02
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

Analysis of complex materials

1. Brass
2. Cement

Solvent Extraction methods

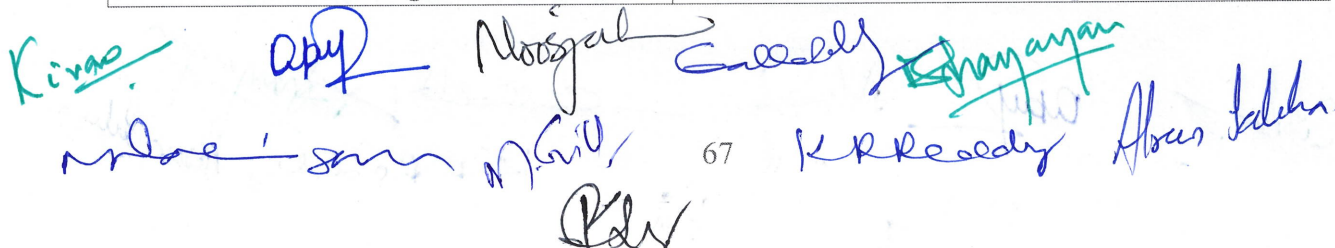
1. Determination of Ni as Ni-DMG complex
2. Determination of Fe as Fe-Oxine complex
3. Determination of Pb as Pb-Diathiazone complex

Reference Books:

1. Vogel's Text book of quantitative Chemical analysis G.H. Jeffery et.at. Addison Wesley Longman
2. Dean's analytical Chemistry hand book by McGraw-Hill.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURUUNIVERSITY SEMESTER-VI

Course Code: 6-P2	Number of Credits- 02
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester



Identification of unknown organic compounds: Single Compound

Systematic Identification of Organic Compounds – Preliminary examination, detection of extra elements, solubility, common functional group test, functional group tests (determination of two functional group in a single component, if at all present), Preparation of two rational derivatives.

List of suggested compounds:

Glucose, fructose, benzaldehyde, paraanisaldehyde, p-chlorobenzaldehyde, acetophenone, p-nitro acetophenone, phenol, cresols, naphthols, benzoic acid, p-chloro benzoic acid, aniline, p-toluidine, p-anisidine, p-chloro aniline, diphenylamine, N, N-dimethyl aniline, benzamide, naphthalene and anthracene.

Recommended Books:

Organic analytic Chemistry - Jagmohan

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURUUNIVERSITY SEMESTER-VI

Course Code: 6-P3	Number of Credits- 02
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

1. Kinetics of Persulphate – Iodide reaction (Comparison of rate constants at different Iodide concentration)
2. Varification of Ostwald's dilution law and the determination K_a - Conductometry
3. Solubility product of AgCl , BaSO_4 – Conductometric method
4. Determination of heat of solution of Benzoic acid by solubility method.
5. Potentiometry:
 - a) Determination of single electrode potential
 - b) Determination of isoelectric point of glycine
 - c) Determination of PK_a of Chloroacetic acid
 - d) Verificatin of Gibbs – Helmholtz equation
6. Distribution of Iodine between CCl_4 and aqueous KI (Determination of unknown concentration of KI)

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURUUNIVERSITY SEMESTER-VI

Course Code: 6-P4	Number of Credits- 02
Title of the Course: General Chemistry	Total Instruction Hours- 60 per Semester

1. Estimation of iron in the given sample of haematite by dichromate method
2. Estimation of percentage of Ca in Limestone by Oxalate method

3. Estimation of magnesium in the given sample of dolomite (MgCO_3 , CaCO_3) by EDTA method.
4. Conductometric titration of mixture of acids Vs strong base.
5. Conductometric titration of acids+ salt Vs strong base

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
VI	50	10	40	10

No. of Papers:	Theory	5	Marks: 5 x 60 = 300
	Practical	4	4 x 50 = 200
	Seminar	1	1 x 50 = 50

Total Marks: 550

**DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-VII**

Course Code: 7-T1	Number of Credits- 04
Title of the Course: General Chemistry	Total Instruction Hours- 60 per Semester

Unit – I : Vibrational (IR and Raman) Spectroscopy

15 h

Infrared Spectroscopy: Vibrational energy of a diatomic molecule – anharmonic oscillator – selection rules – overtones – hot bands. Zero-point energy – calculation of force constant of diatomic molecules: Rotational – Vibrational spectra of diatomic molecules – P, Q, R branches. Instrumentation – sources of radiation, sampling techniques. Normal modes of vibrations for linear and non-linear molecules (Stretching, bending, scissoring, rocking, twisting, wagging). Functional group frequencies – Factors influencing vibrational frequencies- coupled vibrations and Fermi resonance – combination bands. Application of infrared spectroscopy – structure elucidation of simple organic molecules – benzene and its substituted derivatives-cis-and trans- isomers and keto-enol tautomers- hydrogen bonding isotopic effect-study of metal-ligand bonding in complexes. IR spectra of ethylalcohol, acetophenone, mesityl oxide, benzaldehyde, aniline and acetaldehyde.

Raman Spectroscopy: Raman effect-Quantum theory-selection rules-Rotational and Vibrational Raman effect Instrumentation. Mutual exclusion principle. Raman spectra of Hg_2^{2+} , NO_3 , ClO_3 , N_2O , CO_2 and CH_4 .

Unit-II: Advanced NMR Spectroscopy

15 h

Spin-Lattice (T_1) and spin-spin relaxation (T_2). Spin echo polarization transfer-Spin echo measurements. ^{13}C -NMR spectral editing techniques: attached proton test (APT spectra) by gated spin echo, cross polarization, INEPT spectra, DEPT spectra (Distortion less

enhancement by polarization transfer) eg: $(\text{Cl}(\text{CH}_2)_3\text{Si}(\text{OCH}_3)_3)$. INADEQUATE spectra (incredible natural abundance double quantum transfer experiment).

Two dimensional NMR: basic principles, types of 2-D NMR; (i) J-resolved spectroscopy (a) homo and (b) hetero nuclear J-resolved spectroscopy (ii) correlation spectroscopy; Homo nuclear shift correlation spectroscopy (COSY) and hetero nuclear shift correlation spectroscopy (HECTOR) (iii) NOESY (Nuclear Overhauser Enhancement Spectroscopy). HOESY (two dimensional hetero nuclear NOE). Advantages of 2-D NMR.

Unit-III: Mass Spectroscopy

15 h

Ionization of molecules – Instrumentation – Determination – Determination of molecular formula – General patterns of fragmentation-preliminary account of chemical Ionization-Applications of Mass Spectroscopy in the structural determinations: Fragmentation patterns in different functional group systems and individual heterocyclic systems (Furan, Pyrrole, Thiphenne and Pyridine).

Unit-IV: Photoelectron, AUGER Electron & Mossbauer Spectroscopy

15 h

- A) Photoelectron spectroscopy-principles, koopman's theorem, Block diagram of photoelectron spectrometer. Ultraviolet photoelectron spectroscopy (UPS), applications of UPS to O_2 and N_2 molecules. X-ray photoelectron spectroscopy (XPES/ESCA), chemical shift, applications of XPES in qualitative analysis, structural analysis and surface studies.
- B) AUGER electron spectroscopy – Principles, Instrumentation and applications.
- C) Mossbauer Spectroscopy – Principles, Block diagram for experimental set-up, Recording mossbauer specturam, Isomer shift, Quadrupole interactions and Magnetic Interactions, applications of Mossbauer spectroscopy in the study of iron and tin compounds.

Recommended Books:

1. Physical methods in Chemistry by R.S. Drago
2. Instrumental methods of analysis Willard, Dean & Settle
3. Organic Spectroscopy , William Kemp.
4. Principles of Instrumental analysis, Skoog, Holler and Wieman, Harcount Asia, PTE Ltd.
5. Introduction to photoelectron spectroscopy, P.K. Ghosh, John Wiley
6. Applications of Mossbauer Spectroscopy, Green Mood
7. Structural Inorganic Chemistry – Mossbauer Spectroscopy, Bhide
8. Spectroscopic Indentification of organic Compounds, Silverstein, Basseler and Morril
9. Application of absorption spectroscopy, John R.Dyer
10. NMR in Chemistry – A multinuclear introduction by Willam Kemp
11. Spectroscopic Identification P.S. Kalsi
12. ^{13}C NMR for organic Chemists, G.C. Levy and G.L. Nelson.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VII

Course Code: 7-T2	Number of Credits- 04
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

15 h

Metal Carbonyls: General methods of preparing metal carbonyls- Ligational properties of CO, donor and acceptor molecular orbitals of CO. Bonding modes of CO, Evidence for multiple bonding structural and bonding aspects of Ni(CO)_4 , $\text{Mn}_2(\text{CO})_{10}$, $\text{Fe}_2(\text{CO})_9$ and $\text{Co}_2(\text{CO})_8$. Eighteen electron rule in metal carbonyls, Fluxionality in metal carbonyls. Isolobal analogy. Vibrational spectra of metal carbonyls. Metal clusters – Factors favoring metal-metal bond, classification of metal cluster, structures of molecules with single, triple double and quadruple M-M bonding. Metal nitrosyls: General methods of preparing metal nitrosyls. Donor and acceptor molecular orbitals of NO, bonding modes of NO, structural and bonding aspects of Mn, Ru and Os nitrosyls.

15 h

Basics of Photochemistry, Properties of excited states- structure, acid- base strength and reactivity states of metal complexes- comparison with organic compounds, Electronically excited states of metal complexes. Types of photochemical reactions: Photocshustitution – Photsolvation and photoionization, photoisomerization of transition metal complexes. Photochemical composition of water using CdS and Ru(bipy)3)3+.

15 h

Concept of symmetry in chemistry-symmetry operations-symmetry elements: rotational axis of symmetry and types of rotational axes, plane of symmetry and types of planes, improper rotational axis of symmetry, inversion center and identity element-more about symmetry elements-molecular point groups; definition and notation of point groups, classification of molecules into C_1 , C_s , C_i , C_n , C_{nv} , C_{nh} , $C_{\infty v}$, D_n , D_{nh} , D_{nd} , $D_{\infty h}$, S_n (n =even), T_d , O_h , I_h , K_h groups. Descent in symmetry with substitution-exercises in molecular point groups-symmetry and dipole moment-symmetry criteria for optical activity

15 h

Nitrogen: Dinitrogen complexes – Isoelectronic species CO, CN⁻ and N₂⁻ Comparison and stability of metal complexes of these ligands. Allen's salt, Preparation of dinitrogen complexes of Ru, Mo and W, bonding and structures of dinirtrogen complexes. Reactions of coordinated dinitrogen, Biological nitrogen fixation.

1. Principles and applications of Organotransition metal chemistry, Collman

2. The Organometallic chemistry of transition metals, Crabtree
3. Metalloorganic Chemistry, Pearson
4. Homogenous catalysis, Vol. I & II, M.M. Taqui Khan & A.E. Martell. Inorganic chemistry J.E Huheey, E.A. Keiter and R.L. Keiter, 4th ed., Harper Collins College Publishers.
5. Advanced In organic Chemistry by I.A. Cotton and G. Wilkinson ed., Willey Interscience.

Kiran apy Abhishek Chellu Ishanryan
Anshuman M. Gidh K. Reddy Abhin Salika.
PKW

6. Inorganic Chemistry D.F. Shriver and P.W. Atkins 3rd ed., Oxford
7. Concise Inorganic Chemistry J.D. Lee, Blackwell Science
8. Concepts and models of Inorganic Chemistry B.E. Douglas, D.H. McDaniel and J.J.

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DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-VII

Course Code: 7-T3	Number of Credits- 04
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester

Unit – I: Organic Synthesis

15 h

Reagents in organic synthesis: Use of the following reagents in the organic synthesis and functional group transformations. Phase transfer catalysts-tetra alkyl ammonium halides and crown ethers, Woodward-Prevost hydroxylation. 1, 3-dithianes (reactivity and Umpolung effect). Lithium diisopropylamide(LDA). Dicyclohexyl carbodimide (DCC): Trimethyl silyl iodide, Tri-n-butyl tin hydride, dichloro dicyano benzoquinone (DDQ) selenium dioxide. Wilkinson's catalyst and Baker's yeast.

Unit-II: Reaction Mechanism-II

15 h

Study of the free radicals: mechanisms of free radical substitution at paraffinic, allylic and benzylic carbons. Free radical aromatic substitutions. Auto oxidation: introduction to free radical rearrangements. Selective organic name reactions: Mannich reaction, Michael addition, Tschichibabin reaction, Shapiro reaction. Barton reaction, Rearrangement reactions: Hoffmann, Curtius, Favorski, Bayer-Villiger, Beckmann, Fries, Benzidine, Benzil-Benzilic acid and Dienone-Phenol rearrangements.

Unit-III: Heterocyclic Chemistry

15 h

Synthetic methods and reactivity of the following five membered heterocyclic systems: Carbazoles, Pyrazoles, Indazoles, Imidazoles, Benzimidazoles, Benzoxazoles, Isoxazoles. Thiazoles, Benzthioazoles.

Unit-IV: Stereochemistry – II

15 h

Use of physical methods in determining the preferred conformers of simple organic molecules such as 1,2 dihaloethanes, halo hydrins and vicinal diols- conformation and relative stability and reactivity of diastereomers. Stereo chemistry of addition and elimination reactions, neighbouring group participation and intra molecular rearrangements. Absolute and relative configurations. Optical isomerism due to restricted rotation, atropisomerism, conformation and reactivity of individual molecules conformation of mono and disubstituted cyclohexane and factors governing the reactivity of equatorial and axial substituents attached to the cyclohexane ring. Introduction to the conformation of other mono cyclic systems stereo chemistry of bicycle systems involving 5 and 6 membered rings. Conformations of cyclohexanone stereo chemistry of addition to the carbonyl group in rigid cyclohexanone system ORD studies: optical rotation and optical rotatory dispersion, Axial haloketone rule: Octane rule: applications of ORD studies in the determination of configuration and conformation of organic molecules.

Recommended Books:

1. Organic Reagents – by Fieser and Fieser

K. V. S.
apj
mylaigan
Mya
72
PRV
72
K. P. Reddy
Mya
Abbas Salcha

2. Organic Reagents by House
3. Mechanism and Structure in Organic Chemistry by S. Mukherjee
4. Heterocyclic Chemistry by J. Joule and Smith
5. Stereochemistry of Organic Compounds Principles & Applications by D. Nasipur
6. Stereochemistry of Confirmation and mechanism by PS Kalsi
7. Heterocyclic Chemistry by R.K. Bansal

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-VII

Course Code: 7-T4	Number of Credits- 04
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

Unit – I: Heterogeneous Catalysis

15 h

Adsorption and types of adsorptions – classification of adsorption isotherms - Heat of adsorption and its determination - Freundlich adsorption isotherm – Derivation of Langmuir adsorption isotherm – B.E.T equation derivation and its limitations. Determination of surface area of solids mechanism of heterogeneous catalysis. Langmuir – Hinshelwood mechanism and Langmuir Reidel mechanism. Examples of heterogeneous catalytic reactions – hydrogenation of ethylene, synthesis of ammonia, oxidation of SO_2 and Fischer – Tropsch method for the synthesis of methanol. Gibbs adsorption equation.

Unit-II: Phase – Transfer Catalysis

15 h

Classifications, Characteristics and criterion for PTC catalysts. Mechanism and types of PTC catalyzed reactions. Preparation of PTC catalysts like quaternary salts, tetrahexyl ammonium bromide and crown ethers. Applications to hydrolysis, oxidation reduction, esterification and formations of ethers. Metal ion catalysis: Molecular activation, Proximity, interaction and catalytic cycle. Application to hydrogenation, isomerisation, oxidation and hydroformylation.

Micellar catalysis: Micellization and types of surfactants – critical micellar concentration (CMC) and its determination – factors affecting CMC. Solubilization in surfactant solutions. Emulsion polymerization mechanism.

Unit-III :Quantum Chemistry – I

15 h

Planck's quantum theory and derivation of Planck's temperature radiation law- Derivation of time independent Schrodinger wave equation – wave function and significance of ψ and ψ^2 – Normalization and orthogonality of wave function – well behaved functions – operations like momentum(p), angular momentum (l), energy (E) Hamiltonian(H) and Hermitian – Properties of Hermitian operator- Operator algebra – postulates of quantum mechanics. Applications : application of Schrodinger wave equation to particle in a one dimensional box and three dimensional box- degenerate states – quantum mechanical tunneling (qualitative treatment).

Unit – IV: Kinetics & Photochemistry

15 h

Kinetics: Substituent effect: Hammett's and Taft's equations – Use of σ and ρ constants and extended Hammett equation. Yukawa – Tsuno equation – Non – linear Hammett's plots – Isokinetic temperature and its determination. Solvent effect: Solvent solute interactions and

solvation parameters – effect of solvent on reactivity – solvolysis and nucleophilic substitution reactions. Grunwald – Winstein equation, Swain – Scott equation, Edward equation. Swain – Scott equation, Edward equation. Photochemistry: Photophysical process – Radiationless processes (Vibrational relaxation, internal conversion, intersystem crossing) and their rate constants – Radiative processes – Fluorescence emission, phosphorescence emission. Kinetics of photophysical unimolecular processes – Delayed fluorescence. Quantum yield and its determination, fluorimetry, phosphorimetry. Bimolecular processes: Quenching – Stern – Volmer equation derivation and deviations. Photochemical processes – Unimolecular processes. Kinetics of photolysis of HI. Formation of HCl and Br reactions – Derivation of rate expressions. Photosensitized reactions.

Recommended Books:

1. Chemical Kinetics by K.J. Laidler-McGraw-Hill
2. Principles of Biochemistry by A. Lehninger, Butterworth Publishers
3. Advanced Inorganic Chemistry by F.A. Cotton & G. Wilkinson.
4. Organometallic Chemistry by R.C. Mehrotra
5. Biochemistry by Boet and Boet, John Wiley
6. Catalysis by J.C. Kuriacose-Macmillan India Ltd.
7. Quantum Chemistry by N. Levine, Prentice-Hall
8. Introduction to Quantum Chemistry by A.K. Chandra, Tata McGraw-Hill
9. Quantum Chemistry by D.A. McQuarrie, Viva Books Pvt. Ltd.
10. Quantum Chemistry by R.K. Prasad, New Age International Pvt. Ltd
11. Text book of Advanced Physical Chemistry by Gurdeep Raj.
12. Fundamentals of Photochemistry – K.K. Rohatgi, Mukharjee Wiley Eastern Ltd. 1978
13. Photochemistry by R.P. Wayne – Oxford University Press
14. Calvert. J.G. and Pitts, J.N. Photochemistry Wiley 1966
15. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Co. New Delhi (15 Ed.) 2006.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER-VII

Course Code: 7-P1	Number of Credits- 02
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

Gravimetric Analysis

1. Gravimetric estimation of iron as iron (III) oxide
2. Gravimetric estimation of barium as barium(II) sulphate
3. Gravimetric estimation of copper as Cu(I) thiocyanate
4. Gravimetric estimation of nickel as Ni(II) dimethyl glyoximate
5. Gravimetric estimation of magnesium as magnesium(II) 8-hydroxy quinolate

Kiva. *apd* *Noorah* *Galeed* *Shayman*
mla *m-hill* *PRV* 74 *KR Reddy* *Arun Balcha*

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VII

Course Code: 7-P2	Number of Credits- 02
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester

A. Three Stage Preparations

1. p-bromo aniline from Aniline
2. p-nitro aniline from Aniline
3. o-Chloro benzoic acid from Pthalic anhydride
4. m-nitroaniline from benzene
5. Tribromobenzene from nitrobenzene

Recommended Books:

1. Text book of Practical Organic Chemistry – Vogel.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VII

Course Code: 7-P3	Number of Credits- 02
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

1. Potentiometry

- a) Titration of mixture of acids by a strong base
- b) Determination of PKa of weak acid
- c) Redox titration of
 - i) Fe(II) and $K_2Cr_2O_7$
 - ii) Fe(II) and Ce(IV)
- d) Precipitation reactions
 - i) KCl and $AgNO_3$
 - ii) KCl + KBr and $AgNO_3$
 - iii) KCl + KBr+ KI and $AgNO_3$

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VII

Course Code: 7-P4	Number of Credits- 02
Title of the Course: General Chemistry	Total Instruction Hours- 60 per Semester

Analysis of binary Mixtures

1. Determination of Cu^{2+} Ni^{2+}
2. Determination of Fe^{3+} Al^{3+}
3. Determination of Cu^{2+} Zn^{2+}

Kinetic of Persulphate Iodide reaction

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Kira, Apu, Noorah, 75, K. P. Reddy, Shreyas, Anur, Salika, M. Gid, P. Ch.

- i) Determination of order
- ii) Solvent effect
- iii) Salt effect
- iv) Temperature effect

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
VII	60	15	40	10

No. of Papers:	Theory	4	Marks: 4 x 75 = 300
	Practical	4	4 x 50 = 200
	Seminar	1	1 x 50 = 50

Total Marks: 550

**DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-VIII**

Course Code: 8-T1	Number of Credits- 04
Title of the Course: General Chemistry	Total Instruction Hours- 60 per Semester

Unit – I : Group Theory

15 h

Isomorphis. The great orthogonality and normality theorem (without proof): Reducible and Irreducible representations: Direct product rule. Matrix representation of symmetry operations of C_{2v} and C_{3v} groups: Construction of character tables for C_{2v} and C_{3v} - Group theoretical approach to predict allowed and forbidden UV transitions in ethylene and formaldehyde, IR active and Raman active modes of water molecule.

Unit II: NMR spectroscopy-II (1H , ^{19}F and ^{31}P NMR)

15 h

1H , ^{19}F , ^{31}P and solid state NMR spectroscopy: First order and non first order spectra e.g., AX, AX_2 , AX_3 , A_2X_3 , AMX and AB, ABC. Simplification of complex spectra: increased field strength, deuterium exchange, Lanthanide shift reagents and double resonance techniques. Discrimination of enantiomers by use of chiral NMR solvents (CSAs), chiral lanthanide shift reagents and Mosher's acid. Nuclear Overhauser enhancement (NOE). Fluxional molecules bullvalene, $[\eta^5-C_5H_5M]$, $[\eta^5-(C_5H_5)_2 Ti \eta^1-(C_5H_5)_2]$ and $[\eta^4C_8H_8Ru(CO)_3]$.

^{19}F NMR spectroscopy: ^{19}F chemical shifts, coupling constants. Applications of ^{19}F NMR involving coupling with ^{19}F , 1H and ^{31}P : 1,2 dichloro-1,1 difluoro ethane, BrF_5 , SF_4 , PF_5 , ClF_3 , IF_5 , CF_3CH_2OH

Handwritten signatures and initials: Ki, apy, Abazgul, Ceealy, Ishanayan, M. K. R. P. W., K. P. Reddy, Aban Palcha, 76

³¹P NMR spectroscopy: ³¹P chemical shifts, coupling constants. Applications of ³¹P NMR involving coupling with ³¹P, ¹⁹F, ¹H and ¹³C: ATP, Ph₃PSe, P₄S₃, H₃PO₄, H₃PO₃, H₃PO₂, HPF₂, PF₆⁻, PH₃, [Rh(PPh₃)Cl₃] (Rh I=1/2)
Introduction to solid state NMR: Magic angle spinning (MAS). Applications of solid state NMR.

15 h

Electron spin resonance spectroscopy (ESR): Introduction – Principles involved in ESR Spectroscopy. Instrumentation – Presentation of ESR spectra Hyperfine coupling : ESR spectrum of hydrogen atom, Lande's splitting factor and its significance. ESR spectra of radicals like methyl, ethyl, isopropyl, benzene (anion & Cation radicals), 1, 4-benzoquinone and naphthalene anion, NH_2 , NO. Zero field splitting and Kramers degeneracy, applications of ESR spectroscopy to 3d-metal complexes with respect to structure and bonding- Cu(II) – Salicylaldehyde complex, superoxo complexes of Co(III). Nuclear Quadrupole Resonance spectroscopy: Basic Principles, Quadrupole nuclei, quadrupole moment, Electric field gradient, Nuclear quadrupole coupling constant, applications of NQR.

15 h

X – ray Diffraction : X –rays and their generation – choice of radiation ; Miller indices, Braggs equation, Experimental methods – Powder and single crystal methods, Indexing the reflections, Systematic absences, Electron density studies by X – rays – Platinum phthalocyanine complex, Silylacetate, Tetraalkylbiphosphate ; Advantages and limitations of X – ray Diffraction.

Electron Diffraction by gases :Principles , Radial distribution curves- Interpretation of results for PBrF_2S , PF_3S , PF_2HS , HClO_4 , Silylmonothioacetate and Germylmonothioacetate and HgCl_2 molecules, Advantages and Limitations.

Neutron Diffraction: Principle, Application in Hydrogen bonding studies, combined use of X-ray and Neutron diffraction studies, Advantages and limitations.

Reference Books:

1. Chemical applications of Group theory – F.A. Cotton, Wiley, Newyork, 1990.
2. Molecular spectroscopy patel and patel
3. Physical methods for chemistry- R.S. Drago, Saundes, 1992
4. H.H. Jaffe and M.Orchin, Symmetry, Orbitals and Spectra, Wiley, Newyork
5. Raman, K.V. Group theory and its applications to chemistry, Tata McGraw-Hill
6. P.K. Ghosh, Introduction to Photoelectron Spectroscopy, Wiley
7. Chang, R.Basic Principles of Spectroscopy, Mc Graw-Hill
8. Symmetry and Spectroscopy of molecules, K.Veera Reddy New Age Publishers.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-VIII

Course Code: 8-T2	Number of Credits- 04
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

15 h

Unit: Organometallic Compounds - I

Classification based on bonding and hapticity and nomenclature of organometallic compounds. 18 electron rule and stability of organotransition metal compounds. Principles of synthesis of organometallic compounds. Synthesis, structure and properties of organometallic compounds of Mg B and Al. Applications of organometallic compounds of Li, Mg and B in organic synthesis.

Unit-II: Bio-Inorganic Chemistry

15 h

Metals ions in biological systems: Brief survey of metal ions in biological systems. Basic principles underlying biological selection of elements. Effect of metal ion concentration and physiological effects. Oxygen transport and storage: Hemoglobin and myoglobin – Gemetric electronic and magnetic aspects of dioxygen binding. Oxygen adsorption isotherms and cooperativity, physiological significance of hemoglobin. Role of globin chair in hemoglobin. Metals in medicine Introduction, Metals used for diagnosis, Radiodiagnosis, Magnetic resonance imaging. Metals used for therapy-Lithium, gold and platinum. Chelate therapy.

Unit-III : Nanomaterials-I

15 h

Definition, Fundamental concepts, size concerns, Nanotools, safety of manufactured nanomaterials, Nanotechnology and interdisciplinancy subject, Nanostructured materials(NsM) and Nanocrystalline materials, applications of nanotechnology and nanomaterials, Nanoparticles, Classification, Fabrication of nanoparticles, Characterization, Properties and applications, ZnO and iron nanoparticles.

Unit-IV : Nanomaterials-II

15 h

Dendrimers: Definition, Synthesis-Divergent and convergent methods, structures, properties and applications. Nanocomposites: Polyhedral silsesquioxanes: Inorganic –Organic Hybrid Nanoparticles Carbon nanotubes: Structural aspects, Properties of carbon nanotubes: Chemical, mechanical and electromagnetic, carbon nanotubes in electrical connections- Metallic and semi-Conducting carbon nanotubes, carbon nanotube interconnects, carbon nanotube transistors, carbon nanotubes as fibres and films.

Reference Books:

1. Nanochemistry by G.B. Sergeev, Elsevier
2. Inorganic Chemistry by D.F. Shriver and P.W. Atkins, 3rd ed., Oxford
3. Nanochemistry : A. Chemical approach to Nanomaterials, G.A. Ozin & A.C. Arsenault RSC Publishing.
4. Principles of Bioinorganic Chemistry S.J. Leppard & J M Berg
5. Inorganic Biochemistry Vol.I & II, by ed. G.L. Eichorn
6. Bio-Inorganic Chemistry by Bertini, Gray, Lippard & Valentine
7. Bio- Inorganic Chemistry by K. Hussain Reddy

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER-VIII

Course Code: 8-T3	Number of Credits- 04
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester

Unit-I: Organic Photo Chemistry

15 h

Comparison of thermal and photo chemical excitation of molecules. Fate of excited state molecules Morse curve- Jablonsky diagram-flourescence and phosphorescence – carbonyl photo chemistry, α - cleavage, hydrogen transfer – Norrish type (I and II) reactions – Photo reduction – PaternoBuchi reaction, photo chemistry of olefins, cis-trans-isomerizations, conjugated olefins- Barton reaction – Photo chemistry of arenes- study of the mechanism of photo chemical reactions – detection of intermediates- sensitization and quenching – Di- π – methane rearrangements.

Unit-II: Pericyclic Reactions

15 h

Orbital representation of molecular orbitals, bonding, non-bonding and anti bonding, symmetry properties of molecules with 2,3,4,5,6 and 7 contiguous sp^2 carbon systems with special reference to plane of symmetry and two fold axis of symmetry. Electro cyclic reactions of 4 and 4+2 electron systems. Orbital correlation diagram methods-cycloadditions 4 and 4+2 systems OCD method endo preference in Diels-Alder additions. FMO approach for electro cyclic reactions. (1,3), (1,5) and (1, 7) sigma tropic rearrangements – Cope and Claisen rearrangements, elementary treatment of PMO approach – exercises based on pericyclic reactions – Sommet reaction, Hauser reaction.

UNIT – III: Formation of C-C single and C-C double bonds

15 h

C-C Single Bonds: Alkylation- importance of enolate anions: Alkylation of relatively acidic methylene group; alkylation of ketones the enamine reaction lithium dialkylcuprates (Gillman's reagent). Synthetic application of carbenes and carbenoids. C-C double bonds: beta elimination reactions: pyrolytic elimination reaction; Wittig and related reactions – Peterson olefination (stereo selective synthesis of tri and tetra substituted ethylenes) – Oxidative decarboxylation of carboxylic acids.

UNIT – IV: Oxidations and reductions

15 h

Oxidation: oxidation of C-C bond with transition metal oxidants – $KMnO_4$ and OsO_4 stereochemistry of per hydroxylation. Epoxidation and subsequent transformation of epoxides. Reaction of alkenes with single oxygen. Cleavage of glycols with HIO_4 and $Pb(OAc)_4$. Allylic oxidation with transition metal oxidants. Reduction: Group III hydride transfer reagents ($NaBH_4$ and $LiAlH_4$) to reduce carbonyl groups and other functional groups. Stereochemistry of hydride reductions cyclohexanone. Group IV hydride donors; Dissolving metal reductions: addition of hydrogen- reductive removal of functional groups. Reductive C-C (single) bond and C-C (double) bond formation.

Recommended Books:

1. Molecular reactions and photo chemistry by C.Dupey and O.L. Chapman
2. Molecular photo chemistry by Turru
3. Some modern methods of organic synthesis IV Carruthers
4. Guide book to Organic synthesis by R.K. Meckr D.M. Smith R.A. Atken
5. Organic synthesis O. House
6. Organic synthesis by M B Smith
7. Organic synthesis by Carray and Sandberg.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-VIII

Course Code: 8-T4	Number of Credits- 04
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

Unit-I: Homogeneous catalysis

15 h

Homogeneous acid - base catalysis – mechanism of acid – base catalysis – protolytic and prototropic mechanisms. Specific acid base catalysis – Arrhenius and Van't Hoff intermediates – Activation energies for catalyzed reactions. Mechanism of general acid-base catalysis – Bronsted relationships – types of acidity functions and their determinations. Zucker – Hammett's hypothesis and its applications. Bunnett's and Olsons criteria of acid – base catalyzed reactions. Anchored catalysis: Concept of anchored catalysis and types. Montmorillonite anchored catalysis and its reactions.

Unit-II : Quantum Chemistry-II

15 h

Rigid rotator : application of Schrodinger equation to rigid rotator- derivation of energy expression and wave function of a rigid rotator – Solution of (ψ) and (θ) parts of wave functions – total wave function of rigid rotator.

Hydrogen atom: Separation of (r), (ψ) and (θ) equations – solution of radial equation – total wave function for hydrogen atom – radial and angular plots- probability functions and radial probability density plots for 1s and 2s orbital.

Approximation methods: Variation method – principle and its application to hydrogen atom - method – First order correction terms of energy and wave function – application to particle in an one dimensional box under an electric field.

Unit-III: Quantum Chemistry – III

15 h

Theories of chemical bonding – Born – Oppenheimer approximation, application of variation method. Concept of MO theory – LCAO treatment of H_2^+ and H_2^- . Energies and wave functions shapes of molecular orbital, labeling of molecular orbital. MO diagrams and MO configurations of homonuclear diatomic molecules (H_2 , Li_2 , N_2 , O_2 , F_2) and heteronuclear diatomic molecules (HF , BN , CO , NO) VB treatment of H_2^- and H_2 , wave functions and energies: comparison of VB and MO theories of bonding with reference to homonuclear diatomic molecule (H_2).

Unit- VI: Applications of Electrochemistry

15 h

Corrosion and its prevention: Types of corrosion, Principles of Dry corrosion (Direct chemical attack) – Pilling bedworth rule, wet corrosion (Electro chemical theory) Galvanic Series- Galvanic Corrosion, Concentration cell corrosion. Mechanism of wet corrosion – Hydrogen Evolution type, oxygen absorption type. Factors influencing corrosion: Prevention of corrosion: Proper design, Use of pure metal and metal alloys, passivity cathodic alkaline fuel cells. Advantages of fuel cells, limitations of fuel cells, UPS – Working principle of UPS and applications.

Recommended Books:

1. Quantum Chemistry by N. Levine, Prentice- Hall
2. Introduction to Quantum Chemistry by A.K. Chandra, Tata McGraw-Hill
3. Quantum Chemistry by D.A. McQuarrie, Viva Books Pvt. Ltd.
4. Quantum Chemistry by R.K. Prasad, New Age International Pvt. Ltd
5. Text book of Advance Physical Chemistry by Gurdeep Raj.
6. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Co. New Delhi (15 Ed.) 2006.
7. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd 2007
8. A textbook of Engineering Chemistry by S.S. Dara, S.Chand & Co. New Delhi 2004.
9. Engineering Chemistry by J.C. Kuriacose and J. Rajaram Tata McGraw Hill Co,
10. Chemical Kinetics by K.J. Laidler-McGraw-Hill
11. Catalysis by J.C. Kuriacose-Macmillan India Ltd.
12. An Introduction to Electrochemistry – 4th edn. By Sameul Glasstone affiliated East west Press Pvt. Ltd., New Delhi
13. Electrochemistry by M.S. Yadav Anmol Publications, New Delhi
14. Text book of Physical Chemistry by Puri and Patel
15. Electrochemistry by S. Glasstone

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VIII

Course Code: 8-P1	Number of Credits- 02
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

Ion Exchange Methods

1. Determination of the Capacity of an anion exchange resin
2. Determination of the Capacity of an cation exchange resin
3. Separation and determination of Zn and Mg using a cation exchange resin
4. Separation and determination of Cl⁻ and Br⁻ using an anion exchange resin
5. Determination of the total cation concentration in a water sample

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VIII

Course Code: 8-P2	Number of Credits- 02
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester

MIXTURE ANALYSIS (TWO COMPONENT MIXTURES)/IDENTIFICATION

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Separation and the of the two component mixture of organic compounds in a systematic procedure and systematic identification of each of the component organic compounds by using: Preliminary examination, identification of extra elements, common functional group test, specific functional group test – preparation of atleast two rational derivatives and finally identifying the given compounds by checking the melting points of its derivatives with those in literature.

Mixture for analysis:

1. Strong acid + Neutral
2. Base + Neutral
3. Weak acid + Neutral
4. Neutral + Neutral

At least ten mixtures have to be analyzed by the students

Recommended Book:

1. Organic analytic chemistry by Jagmohan

**DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VIII**

Course Code: 8-P3	Number of Credits- 02
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

1. Colorimetry:

- a) Estimation of Cu(II) by EDTA (monovariation and bivarjation methods)
- b) Estimation of Ni(II) by EDTA
- c) Estimation of Fe(II) by complexing with 1, 10-Phenonthroline.

2. Conductometry::

- a) Replacement reactions
- b) Verification of Onsagar equation with KCl
- c) Saponification of ethyl acetate

3. Polarimetry:

- a) Specific rotation of glucose and sucrose
- b) Acid catalyzed inversion of sucrose – effect of acid – acidity function.

**DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-VIII**

Course Code: 8-P4	Number of Credits- 02
Title of the Course: General Chemistry	Total Instruction Hours- 60 per Semester

Analysis of Ternary Mixtures

1. Estimation of Ag⁺, CU₂⁺ and Ni₂⁺

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- ### Scheme of Examination:

Total Marks: 550

Concepts and principles, Host - guest Chemistry, Non- covalent bonds, crown ethers, cryptands and their metal complexes. Molecular recognition for different types of molecules,

spherical recognition, Tetrahedral recognition. Cooperativity and multivalency. Self-assembly and self - organisation. Design and synthesis of Co- receptor molecules and multiple recognition. Supramolecular reactivity and catalysis supramolecular devices, supramolecular photochemistry.

Unit - iv: Electroanalytical chemistry

15 h

Ion selective electrodes - types of ion Selective electrodes - metal based cation and anion-sensitive electrodes. Membrane electrodes -glass electrodes; Liquid ion- exchange electrodes, solid membrane electrodes, gas sensing membrane electrodes.

Coulometry - principles, Coulometry at controlled potentials; coulometry at constant current and their applications. Polarography (Voltammetry) - Principles, polarographic wave, half - wave potential, polarographic Maxima, experimental methods wave heights - concentration method, standard addition method, measurement of wave height-determination of formula and stability constant for a metal complex, amperometric titrations. Cyclic Voltammetry - principles and applications.

SUGGESTED BOOKS:

1. Bioinorganic Chemistry, Bertine, Gray, Lippard and Valentine, University Science books, California USA 1994.
2. Principles of Bioinorganic Chemistry, S. J. Lippard and M. Berg University Science Books, California 1994.
3. Biological Chemistry of Elements, J.J.R. Franstodasilva and R.J.P Williams Oxford University Press 1991.
4. Metal ions in Biological systems (series), Ed. H. Sigel Marcel Dekkar, Newyark
5. Inorganic Biochemistry, J. A. Cowan, Vch Publishers 1993
6. Advances in Inorganic Biochemistry, edited by G. L. Eichorn & Marzilli
7. Bioinorganic Chemistry, Vol -I Edited by G.L. Eichorn.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURUUNIVERSITY SEMESTER-IX

Course Code: 9-T2	Number of Credits- 04
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

Unit -I; Organometallic Compounds - II:

15 h

Organometallic Compounds of transition metals: Classification of transition metal organometallic compounds based on the nature of the ligands η^1 bonded complexes of transition metals - Alkyls and aryls, types and routes of syntheses, stability and decomposition pathways., Alkylidenes, alkylidyne low valent carbenes and carbenes - synthesis, nature of bond, structural characteristics, organo transition metal compounds with α donor and (II) acceptor ligands η^2 , η^3 , η^4 , organic groups. Preparation, structures and properties of olefin complexes of Nickel group preparation, structures and properties of η^3 - allyl complexes of Nickel and palladium complexes. η^4 - Butadiene complexes of Cobalt, Rhodium.

Unit - II; Organometallic Compounds - III:

15 h

Organ transition metal Complexes of the cyclic n- perimeter: C_nH_n : Preparation, Structure and Reactions of - Fe and Ni Complexes with cyclic η^4 - C_4H_4 (R_4) ligands. Fe, and Os complexes with η^5 - (C_5H_5) ligands. Complexes with η^6 (C_6H_6) ligands and their carbonyl derivatives of Cr Metal.

Organometallic compounds of lanthanides: Comparison of organometallic Chemistry of d- and f- block metals. Homoleptic organo lanthanides, cyclopentadienyl and pentamethyl

84

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cyclopentadienyl complexes of trivalent and divalent lanthanides - structures and applications in organic synthesis and catalysis.

Unit- III: Inorganic reaction mechanisms

15 h

Reactivity of metal complexes: inert and labile complexes concept of inertness and lability of complexes in terms of Valence bond and crystal field theories. Nucleophilic substitution reaction of Octahedral complexes. Dissociative (SN1) and associative (SN2) mechanism.

Acid hydrolysis: factors affecting acid hydrolysis, base hydrolysis: Conjugative base (CB) mechanism. Evidences in favor of conjugative base mechanism. Nucleophilic substitution reaction mechanism of square planar complexes. Trans effect, theories of trans effect polarization theories and (II) – bonding theory. Applications of trans effect.

Electron transfer reactions: inner sphere and outer sphere mechanisms. Cross reactions and Marcus – Hush theory. 18e rule and its importance in organo metallic reaction mechanisms. Nucleophilic addition reactions and Davis – Green – Mingos rules. Migration reactions: hydride migration and alkyl migration reactions, oxidative addition reactions with special reference to addition of XY to $(IrH(CO)(PPh_3)_3)$

Unit – IV: Homogenous Catalysis

15 h

Stoichiometric reactions for catalysis, catalytic reactions and the valence electron (16/18) rule, Oxidative addition reaction (H-H, H-X and R-X); reductive elimination reactions: α and β elimination reactions and cyclometallation reactions. Asymmetric hydrogenation: Olefin oxidation (Wacker's process) Oligomerization & polymerization (Ziegler – Natta Catalysis), water gas shift reaction and Fischer – Tropsch reaction, Hydrogenation and Hydro Formylation.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER-IX

Course Code: 9-T3	Number of Credits- 04
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester

I. Synthetic Methodology

15 h

Introduction – Target molecule, criteria for target selection, Retro synthesis-the disconnection approach for organic synthesis with examples(Simple molecules) – functional group interconversion (FGI), disconnection method – disconnection and synthon – reagent, transform – synthetic equivalents, strategic bond approach – synthetic tree, chemo selectivity, regio selectivity and stereo selectivity with examples – Linear and convergent synthesis.

II. Strategies in Asymmetric Synthesis

15 h

Asymmetric synthesis – Chiral Auxillaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions, determination of enantiomeric and diastereomeric excess, enantio – discrimination, and kinetic. Combinatorial synthesis of organic libraries with examples of solution phase and liquid phase libraries.

III. Protection of functional groups & Combined applications of Spectroscopy

15 h

Principles of (1) protection of alcohols-ethers formation including silyl ether – ester, benzyls and benzoyls (4) protection of amines – acetylation, benzylation, benzyloxy benzyloxy carbonyl and triphenyl methyl group. Protection of carbonyl groups acetal, ketal, 1-2-glycols and 1,2-dithioglycol formation.

Kir. Aay. Nargul. Suresh. Shreyan. N. Hill. K. P. Reddy. Abhishek. 85. B.V.

Introduction to the analytical approach towards the structure elucidation of simple organic molecules, application of UV, IR, PMR and Mass Spectra. Combined spectral analysis of simple organic molecules.

IV. Green Chemistry

15 h

Introduction: Definition, Principle, atom economy and scope. Introduction to alternative approach reactions – principle, scope, utility of solvent free conditions. Solvent free microwave assisted reactions. Introduction, solvent free techniques, reactions on solid mineral supports, Solid – Liquid phase reactions without solvent, support or catalyst. Microwave activation benefits limitations. Ionic liquid-Ionic liquid mediated reactions, advantages.

Recommended Books:

1. Organic Synthesis – The disconnection approach, Stuart Warren
2. Organic Synthesis, Michael Smith
3. Basic Organic Stereochemistry, Eme L. Eliel, Samuel H. Wilen & Michael P. Doyle
4. Stereochemistry of Organic Compounds – Principles & applications, D. Nasipuri
5. Organic Spectroscopy- Principles and applications, Jagmohan
6. Spectrometric identification of Organic Compounds, R.M. Silverstein, G.C. Bassler
7. Green Chemistry – Ahluwalia
8. Green Chemistry – R. Sanghi & M. M. Srivastava.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER-IX

Course Code: 9-T4	Number of Credits- 04
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

Unit-I : Quantum Chemistry – IV

15 h

Concept of hybridization, quantum mechanical treatment of SP, SP² and SP³ hybrid orbital, wave functions and bond angles. Hybrid orbital of oxygen in H₂O. HMO theory of conjugated polyenes, salient features. Application to ethylene allyl systems, butadiene cyclopentadiene and cyclobutadiene systems energy and wave functions. Applications of HMO coefficients to calculate electron density, charge density, bond order and free valence index. HMO theory of heteroaromatic compounds (Pyrrole).

Unit-II : Electrochemistry – III

15 h

Conductance: Conductance of strong electrolytes – Interionic attraction theory – Thickness of ionic atmosphere (no derivation). Debye Huckel Onsager treatment and derivation of conductance equation – tests and deviations – ion association – ion pair formation – association constant – conductance minima and triple ions.

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Electro chemical cells: Chemical cells and concentration cells with and without transference – Liquid junction potential and its determination – Applications of EMF measurements – Determination of pH, pKa and Ksp.

Polarization : Electrode polarization and concentration polarization – decomposition potential and over voltage theories of over voltage – factors influencing over voltage.

Electrokinetic Phenomenon, electrical double layers (Helmholtz and stern potential), Zeta potential and its determination – Electro osmosis and streaming potential, electro capillary phenomena. On selective electrodes – membrane electrodes, theory of glass membrane potential.

Unit-III: Enzyme catalysis

15 h

Specific action and classification of enzymes. Kinetics and mechanism of single substrate reaction. Michaelis – Mentan law – Brigg's Haldane modification- line weaver – Burk plots. Bi-substrate reaction mechanism. Temperature effect and influence of pH on the nature of active site. Inhibition of enzyme catalyzed reactions. Competitive inhibition –non-competitive inhibition. Enzymatic catalytic mechanism by acid- base catalysis, covalent catalysis, metal ion catalysis, Metalysis through proximity and orientation effects, catalysis by preferential transition state binding.

Unit – IV : Spectroscopy

15 h

Photoacoustic spectroscopy: Basic principles of PAS – PAS of gases and condensed systems – chemical and surface applications.

ORD and CD Spectroscopy: Basic concepts of optical rotatory dispersion (ORD) and circular dichroism (CD) deduction of absolute configuration – Cotton effect – octant rules for ketones. Applications of ORD and CD spectroscopy.

ATR Spectroscopy : Basic principle, total internal reflection instrumentation and applications. **Emulsion spectra:** Franck – Condon principle, electronic spectra of polyatomic molecules. Radiative and non radiative decay, internal conversion and intersystem crossing excimers. Excited dimmers and Exciplex. Charge transfer and energy transfer mechanism. Properties of electronically species in comparison with ground state molecules. Electronic spectra of transition metal complexes.

Recommended Books:

1. Quantum Chemistry by N. Levine, Prentice- Hall
2. Introduction to Quantum Chemistry by A.K. Chandra, Tata McGraw-Hill
3. Quantum Chemistry by D.A. Mcquarrie, Viva Books Pvt. Ltd.
4. Quantum Chemistry by R.K. Prasad, New Age International Pvt. Ltd
5. Text book of Advance Physical Chemistry by Gurdeep Raj
6. Advanced Physical Chemistry by Gurudeep Raj, Goel Publishers House, Meerut
7. An Introduction to Electrochemistry – 4th edn. By Sameul Glasstone affiliated East west Press Pvt. Ltd., New Delhi
8. Electrochemistry by M.S. Yadav Anmol Publications, New Delhi
9. Text book of Physical Chemistry by Puri and Patel
10. Electrochemistry by S. Glasstone

11. Molecular Spectroscopy by Patel and Patel
12. 19. Engineering Chemistry by J.C. Kuriyase and J. Rajaram Tata McGraw Hill Co,
13. Enzyme catalysis by K.J. Laidler- McGraw-Hill
14. Principles of Biochemistry by A.. Lehninger, Butterworth Publishers
15. Micelles, Theoretical and applied aspects by B. Moroi-Plenum
16. Advanced Inorganic Chemistry by F.A. Cotton & G.Wilkinson.
17. Physical methods for Chemistry R.S. Drago, Saunders 1992
18. Chang, R.Basic Principles of Spectroscopy McGraw Hill
19. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd 2007
20. A textbook of Engineering Chemistry by S.S. Dara, S.Chand & Co. New Delhi 2004.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-IX

Course Code: 9-P1	Number of Credits- 02
Title of the Course: Inorganic Chemistry	Total Instruction Hours- 60 per Semester

I pH-metry

1. Determination of CO_3^{2-} and HCO_3^- in a mixture
2. Determination of the dissociation constants of
 - (i) Ethylenediamine (en)(H_2L)
 - (ii) Glycine (HL)
3. Determination of binary constants of i) Cu(II)-en and (ii) Ni(II) – Gly Systems

II. Characterization of metal complexes using different physicochemical and spectroscopic methods- two or three examples involving following methods.

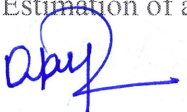
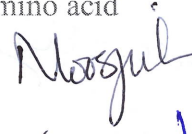
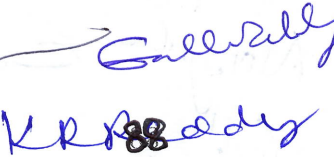




- i) Estimation of metal ions and counter ions
- ii) Conductance measurements
- iii) Thermal methods (TGA & DSC)
- iv) IR, UV- Visible, NMR, ESR spectra

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURUUNIVERSITY
SEMESTER-IX

Course Code: 9-P2	Number of Credits- 02
Title of the Course: Organic Chemistry	Total Instruction Hours- 60 per Semester

I. Estimations

1. Estimation of acetone / ethylmethyl ketone
2. Estimation of aspirin
3. Estimation of acid value
4. Estimation of amino acid

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5. Estimation of unsaturation

6. Estimation of glucose

II. Principles of Chromatography

Determination of R_f -value – ascending and descending techniques – circular paper chromatography – selection of solvents in paper chromatography – Location of spots in paper chromatography

III. Experiments in chromatography

1. Separation of leaf pigments – chlorophyll – 'a' & 'b' xanthophylls
2. Separation of amino acids by paper chromatography
3. Determination of R_f value of glycine by ascending paper chromatography
4. Determination of various impurities by thin layer chromatography
5. Purification of commercial anthracene by column chromatography using benzene.

IV. Spectroscopic identification of Organic Compounds

A set of spectral analytical data for at least 20 compounds will be analyzed by each student and two out of the same compounds will be chosen for the examination from which the student will analyze and identify one compound.

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY PALAMURU UNIVERSITY SEMESTER-IX

Course Code: 9-P3	Number of Credits- 02
Title of the Course: Physical Chemistry	Total Instruction Hours- 60 per Semester

- I. Kinetics Acetone – Iodine reaction – Determination of:
- a) Order b) Acid effect c) Solvent effect d) Temperature effect

II. Potentiometry:

1. Titration involving dibasic and tribasic acids
2. Redox reactions and mixture of metal ions
 - a) ($V^{5+} + Mn^{7+}$) by Fe^{2+}
 - b) ($V^{5+} + Ce^{4+}$) by Fe^{2+}
 - c) ($Fe^{2+} + Sn^{2+}$) by Ce^{4+}

III. Conductometry

1. Dibasic acid Vs NaOH
2. Mixture of Chloroacetic acids Vs NH_4OH
3. Mixture of acids Vs NH_4OH
4. Mixture of acids and $CuSO_4$ Vs NH_4OH
5. Replacement titrations Titration between CH_3COONa and HCl
6. Titration between $ClCH_2COOH$ and $NaOH$
7. Determination of composition of a complex (Copper Vs EDTA)

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KR Reddy

Sreedh

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Abbas Saleha.

IV. Colorimetry

1. Determination of Cu^{2+} and Fe^{3+} in the given mixture by EDTA
2. Determination of Cu^{2+} and Bi^{3+} in the given mixture by EDTA
3. Mixture analysis of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-IX

Course Code: 9-P4	Number of Credits- 02
Title of the Course: General Chemistry	Total Instruction Hours- 60 per Semester

I Spectrophotometry

1. Determination of Manganese in steel
2. Determination of chromium
3. Determination of Manganese and chromium simultaneously.
4. Spectrophotometric titrations of (i) Cu (II) with EDTA (ii) Bi (III) with EDTA (iii) Fe (II) with o-Phen
5. Determination of composition of Complex by Job's Method and Mole ratio Method in the following:
 - (i) Cu (II)-EDTA
 - (ii) Fe (II)-Bipyridyl
 - (iii) Fe (II) – o-Phen

Scheme of Examination:

Semester	Theory Examination		Practical Examination	
	External	Internal	Semester	Internal
IX	60	15	40	10

No. of Papers:	Theory	4	Marks: 4 x 75 = 300
	Practical	4	4 x 50 = 200
	Seminar	1	1 x 50 = 50

Total Marks: 550

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-X

Course Code: 10-T1	Number of Credits- 04
Title of the Course: Polymer Chemistry	Total Instruction Hours- 60 per Semester

Unit-I: Basic Concepts and Specialist polymers

15 h

Basic concepts: Introduction to polymers, monomers, functionality, oligomers, resins and high polymers. Classification of monomers and polymers: thermoplastics and thermosets.

high polymers. Classification of monomers and polymers: thermoplastics and thermosets.

plastics, elastomers and fibers homo and polymers, polymerization techniques bulk solution suspension and emulsion polymerization. **Specialty polymers:** Heat resistant silicone polymers, carbon fibers, conducting polymers-examples-applications. Liquid crystal polymers symmetric, nematic and cholesteric examples applications Ionic polymers: Ion-exchangers (anionic & Cationic) and their applications. Polymer supported reagents and reactions: Peptide synthesis (Merrifield synthesis)- asymmetric synthesis. Polymers in biomedical applications- artificial human body parts: introduction to polymer blends and composites-compatibility and miscibility-examples.

Unit-II: Chemistry of Polymerization

15 h

Polymerization reactions: General principles of polymer formation through addition and condensation. Ring opening polymerization – lactones and lactams. Group transfer polymerization, mathematical polymerization –Bimetallic versus monometallic polymerization mechanism – tacticity, tactic polymers with reference to polypropylene. Condensation polymerization = functional groups-equivalency-mechanism –kinetics and rate expression of acid-catalyzed and self-catalyzed polyester formation –carother's equation. Radical chain polymerization – mechanism-kinetics and rate expression – initiator efficiency, types of initiators- mechanisms. Ionic polymerizations-cationic and anionic polymerization, 4 types of monomers and initiators-mechanism-examples-kinetics and rate expression-living polymers-mechanism-examples-applications.

Unit-III: Polymer Characterization

15 h

Concept of average molecular weight, polydispersity and its significance in polymers. Number average(M_n), weight average(M_w), viscosity average(M_v) and Z-average(M_z) molecular weights, Determination of molecular weight averages by end group analysis, Osmometry (membrane osmometer and vapour phase osmometer), viscosity, gel permeation chromatography (GPC). Universal calibration and light scattering (Debye and Zimm's) methods. Ultracentrifugation-Sedimentation velocity method.

Unit-IV: Analysis, Testing and Processing of Polymers

15 h

Thermal behaviour of polymers: Thermal transitions – glass transition temperature (T_g) and melt temperature (T_m). Factors influencing glass transition temperature(T_g). Determination of glass transition temperature (T_g) by DTA, DSC, TGA and their applications to polymer characterization. Testing of polymers: Chemical analysis: Physical testing of polymers – tensile strength, stress – strain curves, impact strength-Izod and Charpy methods. Fatigue hardness, abrasion resistance. Polymer processing, Principles of compounding, calendaring, casting, moulding- compression, injection, extrusion and blow moulding. Foaming : Fibre spinning – melt, dry and wet spinning with examples.

Recommended books:

1. Polymer science, V R Gowariker N.V. Viswanathan and J.Sreedhar, New Age International Pvt. Ltd.
2. Text book of polymer science, F.W Bill Mayer Jr (John Wiley and Sons)
3. Organic polymer Chemistry, K J Saunders (Chapman and Halls – London)
4. Polymer Chemistry, M G Arora and M Singh (Anmol Publications Pvt. Ltd)
5. Textbook of Polymer Science, P.L. Nayak and S. Lenka (Kalyankar Publishers)
6. Principles of Polymerization, George Odian John Wiley & Sons
7. Polymer Science and Technology, J.R. Fried (Prentice – Hall of India)

8. Organic Synthesis – Special Techniques, V K Ahluwalia and Renu Agarwal (Narosa)
9. Plastics Technology Hand book, Manas Chanda and S.K. Roy (Marcel Decker)
10. Physical Chemistry of Macromolecules D.D. Deshpande (Vishal Publications)
11. Plastics Materials J A Brydson(Buterworth Scientific)

DEPARTMENT OF M. Sc. INTEGRATED CHEMISTRY
PALAMURU UNIVERSITY
SEMESTER-X

Course Code: 10-T2	Number of Credits- 04
Title of the Course: Medicinal Chemistry	Total Instruction Hours- 60 per Semester

I. Basic Concepts in Medicinal Chemistry

15 h

Understanding the terminology of pharmacophore, isosterism, bioisosterism, agonist, metabolite and antimetabolite stereochemistry and drug action with examples. chiral drugs and examples for diastomers, enantiomers.

Nomenclature: chemical name, generic name and trade names with examples. Drugs and receptor sites: concept of receptors and drug – receptor bonding interactions: types of receptors with their selective agonist and antagonist examples and their biological effect. Adrenoceptor and cholinergic receptors.

Classification based on structures and therapeutic activity with one example each.

II. Enzymes targeted drugs

15 h

Drug design through enzyme inhibition. Mode of action of salicylic acid derivatives, salicins and physostigmine drug acting on DHFR and DNA polymerase, inhibitors of angiotensin converting enzymes, B-lactamase (GABA transaminase). (Transition state inhibitors of adenosine deaminase). (Acetylcholine mimetics) acetylcholinesterase inhibitors – physostigmine and carbonyl, anticholinergic alkaloidal drugs-atropine, scopolamine, SAR for muscarinic antagonists.

III. Drug discovery and development

15 h

Separation, isolation of penicillin and penicillin based drug structures. Monographs of drugs – Paracetamol, sulphamethoxazole, Trimethoprim, Salbutamol.

IV: Drug design and synthesis

15 h

Structure, synthesis and mode of action of Zidovudine (AZT), Acyclovir, Ciprofloxacin, Metronidazole, Atenolol, Nifedipine and Diltiazem, Enalapril, Ramapril, Thiazolidinediones, Diclofenac and Ibuprofen and their SAR. Diazepam, Mefloquine, Chloroquine.

Recommended Books:

1. The Organic Chemistry of drug design and drug action, Silverman R. Academic Press
2. Medicinal Chemistry An Introduction, G. Thomas Wiley Blackwell, Chichester
3. Foye's Principles of Medicinal Chemistry, Lippincott, Williams and Wilkins
4. An introduction to Medicinal Chemistry, G.L. Patrick, Oxford Press

92

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5. Pharmacology 6th Edition, Rang. .P., Dale M.M. Ritter, J.M. and Flower R Chruchil
Livingston, Edinburgh
6. Burger's Medicinal Chemistry and Drug discovery Vol. I-5, Wiley
7. Burger's Medicinal Chemistry 6th Edition, Vol. I -6, John Wiley and sons, New York
Editor D.J. Abraham
8. Goodman and Gilman's The Pharmacological basis of therapeutics 11th ed. MC Graw Hill
Medical, New York.
9. Wilson and Gisvold's textbook of Organic, Medicinal and Pharmaceutical Chemistry 12th
edition.
10. Startegy for Organic Drug sysnthesis and Design, Lednicer D. Wiley New York
11. Comprehensive medicinal chemistry, Hansh C, Emmment J.C. Kennewell P.D Vol. I-6
Pergamon press oxford 1960
12. Introduction to medicinal chemistry, Alex Gringauzwiley VCH
13. Pharmaceutical chemistry Volume-I Drug synthesis H.J. Roth and A. Lleemann Ellis
Harwood ltd., Halsted press.
14. Essentials of Medicinal Pharmacology, K.D. Tripathi, Jaypee brothers
15. Pharmacology Goodmann and Gilmann
16. Medicinal Chemistry KorolkovosPharmamed Press
17. Current Good manufacturing practices for pharmaceuticals Manohar A. Potdar
Pharmamed press.

Scheme of Examination:

Semester	Theory Examination		Project Viva-Voce
	External	Internal	External
X	60	15	200

No. of Papers:	Theory	4	Marks: 2 x 75 = 150
	Project Viva-voce	1	1 x 200 = 200
	Seminar	1	1 x 50 = 50
Total Marks:			400

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ndezan *M. Gih* *Kpreach* *Abur Saleha*
PdW

PAPER-V: MEDICINAL INORGANIC CHEMISTRY (9T5)-(Elective paper)

15hrs

Physical effects of metal complex: DNA binding, unwinding, shortening and bending of the double helix. Biological consequences of platinum –DNA binding. Organic intercalators as donor – acceptor pairs; Transition metal complexes as donor acceptor pairs. Non classical platinum antitumour agents.

15hrs

Theory and mode of action of therapeutic chelating agents, Single ligand Chelation Therapy – Aminopolycarboxylic acids, Desferrioxamine, pencillamine, triethylenetetramine, Mixed ligand chelation therapy - Metallothioneins in detoxification. Role of metal ions in the action of antibiotics: Bleomycin, adriamycin and tetracyclines. Gold-Containing drugs used in therapy of Rheumatoid arthritis - A therapeutic agent for Menkes disease: Copper-histidine - Anti viral chemotherapy and metal peptide interaction.

15hrs

Immobilization of enzymes: Methods and Applications. Platinum Metal Complexes as drugs and anticancer agents: Importance of binding and photoreactive metal complexes, ligand dissociation and photoactive metal complexes, ligand dissociation and photosubstitution, photophysics and photochemistry of Ru(II) polypyridyl complexes. Photophysics and photochemistry of Ru(ii) polypiridyl complexes. Photophysics in the absence of DNA and in the presence of DNA.

15hrs

Specific drugs which bind to DNA by intercalation : a) antipyranosomal drugs b) antimalarial drugs c) antitumor drugs. Nonspecific interaction in dye binding to DNA and influence of alcohols and amides. Ruthenium: Ru(III), amine complexes: Antitumor activity

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, structure activity relationship DNA binding and cleavage - DMSO complexes of Ru(II): DNA interactions of polyaromatic amines - Ru(IV) complexes oxidative DNA cleavage. Rhodium: Rhodium(II) acetate dimer. Anticancer activity metallocenes, Chemical correlation with antitumor activity, DNA binding and mechanistic possibility. Introduction, Structural and chemical properties of streptonigrin and its metal complexes - Evidence for formation of ternary complexes involving DNA and its components. Antitumor activity and mechanism - Metal induced free radical production by organic drugs in relation to their side effects.

SUGGESTED BOOKS

1. *Bioinorganic Chemistry. Inorganic elements in the Chemistry of life*, Wolfgang Kaim & Brigitte Schwederdki.
2. *Handbook of Metal-Ligand interactions in Biological fluid Bioinorganic medicine*, Vol - 2 : Edt. Guy Berthon.
3. *Bioinorganic Chemistry*, Rosette M. Roat Malone.
4. *Photoreactions of Metal complexes with DNA*, A. Krisch - De Mesmacker et al.

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SEMESTER – IX (Theory)

PAPER-VI: ADVANCED NATURAL PRODUCTS (9T6)- (Elective Paper)

NP –01 : Biosynthesis of natural products

15 Hrs

Difference between Laboratory synthesis and biosynthesis. Methods for determination of biosynthetic mechanism. Feeding experiments – use of radioisotopes Measurement of incorporation – absolute incorporation, specific incorporation. Identification of labels in labeled natural products by chemical degradation and spectral methods. Major biosynthetic pathways: 1) Acetate-Malonate pathway: Biosynthesis of aromatic compounds, 2) Shikimic acid pathway ; Biosynthesis of essential amino acids – phenylalanine, tyrosine and tryptophan, carboxylic acid derivatives, flavonoids and morphine alkaloids. 3) Mevalonic acid pathway : Biosynthesis of terpenes – mono sesqui, di, tri (β -amyrin) and carotenoids, steroids – cholesterol.

NP – 02 : Structure determination and stereochemistry of natural products by chemical methods

15 Hrs

Determination of structure and stereochemistry of morphine, reserpine, cholesterol rotenone and penicillin.

NP – 03 : Structure determination and stereochemistry of natural products by spectral methods.

15 Hrs

Spectroscopic techniques IR, UV, $^1\text{Hnmr}$, $^{13}\text{Cnmr}$, COSY, HETEROCOSY, NOESY, 2D-INADEQUATE and MS in the structure elucidations of natural products, Examples, flavones, biflavones, flavanones, isoflavones, coumarins, monoterpenes, quinolines, isoquinolines. Study of the following solved problems: INEPT of menthol , APT, DEPT and easy of rhazizine, APT of apparicine, DEPT of papraine, Heteronuclear 2D-J resolved spectrum of stricticine, NOESY of bunaquamarine, HETEROCOSY of strictanol, 2D-INADEQUATE of α -picoline and β -methyl tetrahydran furan.

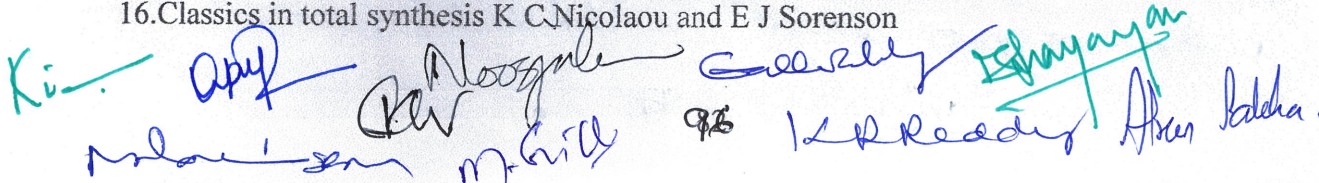
NP – 04 : Total stereoselective synthesis of natural products.

15 Hrs

Woodward's synthesis of reserpine and cholesterol, Corey's synthesis of prostaglandins E2 and F2 α , Sharpless synthesis of L-hexose, Nicolaous synthesis of taxol, Danishefsky synthesis of indolizomycin and Nicolaou's synthesis of calicheamicin.

Recommended books:

1. Textbook of organic chemistry, Vol II by I L Finar
2. Chemistry of natural products, Vol 12, by Atta-Ur-Rahman
3. An introduction to the chemistry of terpenoids and steroids, by William templeton
4. Systematic identification of flavonoid compounds by Mabry & Markham
5. Steroids by Fieser and Fieser
6. Alkaloids by Manske
7. Alkaloids by Bentley
8. The chemistry of terpenes by A Pinder
9. The terpenes by Simenson
10. Terpenoids by Mayo
11. Alkaloids by Pelletier
12. Total synthesis of Natural Products by Apsimon Vol 1-5
13. Biosynthesis by Geismann
14. Principles of organic synthesis 3rd Ed. R O C Norman and J M Coxen
15. One and two dimensional nmr spectroscopy by Atta Ur Rahman
16. Classics in total synthesis K C Nicolaou and E J Sorenson

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SEMESTER – IX (Theory)
PAPER-VII: BIOORGANIC CHEMISTRY (9T7) - (Elective Paper)

BO-01: Enzymes and their action 15 Hrs

Introduction to enzymes. Transition state theory. Acid-Base catalysis. Covalent catalysis— Binding modes of catalysis (i) Proximity effect (ii) Transition state stabilization (iii) Strain and Distortion. Examples of some typical enzyme mechanisms for (1) Triose phosphate isomerase, (ii) α -chymotrypsin and serine protease (iii) Lysozyme (iv) Carboxy peptidase-A (v) Ribonuclease.

BO-02: Enzyme Models and Enzymatic transformations 15 Hrs

Introduction — Biomimetic chemical approach to biological systems-Enzyme models Advantage of enzyme models. Requirements necessary for the design of enzyme models. Host-Guest complexation chemistry. Examples of some host molecules-Crown ether cryptanes, cyclodextrins. Cyclodextrin based enzyme models-Valixarenes, ionophores, micelles and synzymes (synthetic enzymes) — chiral recognition and catalysis. Introduction to industrial enzymes. Enzymatic synthesis of α -amino acids and peptides. Transformations of lipases and esterases. Kinetic resolutions of carboxylic acids, esters and alcohols - Transesterification. Amine resolution-use of oxido-reductase. C-C bond formation using enzymes-asymmetric cyanohydrin formation and asymmetric aldol condensations.

BO-03: Recombinant DNA and Fermentation technology

15 Hrs

Introduction to genetic engineering. Recombinant DNA technology-restriction endonuclease, cloning, linkers, adaptors. Application of recombinant DNA technology in production of pharmaceuticals, diagnosis of diseases, insect control, improved biological detergents, gene therapy-examples. Principles of finger printing technology- Site directed mutagenesis. Fermentation technology: Introduction to fermentation. Industrial fermentation. Advantages and limitations of fermentation. Production of drugs and drug intermediates from fermentation-examples. Chiral hydroxy acids, vitamins, amino acids, β -lactam antibiotics. Precursor fermentation and microbial oxidation and reductions.

BO-04: Coenzymes

15 Hrs

Introduction. Co factors — cosubstrates — prosthetic groups. Classification — Vitamin derived coenzymes and metabolite coenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate (TPP), pyridoxal phosphate (PLP), oxidized and reduced forms of I) nicotinamide adenosine dinucleotide / their phosphates (NAD), NADH, NADP^+ NADPH ii) Flavin adenine nucleotide FAD, FADH_2 and iii) Flavin mononucleotide (FMN, FMNH_2) lipoic acid, biotin, tetrahydrofolate and ubiquinone. Adenosine triphosphate (ATP) and adenosine diphosphate (ADP), S-adenosyl methionine (SAM) and uridine diphospho sugars (UDP-sugars) Mechanism of reactions catalysed by the above coenzymes

Recommended Books

1. Concepts in biotechnology by D. Balasubramanian & others
2. Principles of biochemistry by Horton & others.
3. Bioorganic chemistry - A chemical approach to enzyme action by Herman Dugas and Christopher Penney.
4. Chirotechnology by R. Sheldon

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SEMESTER – IX (Practicals)
PAPER-V: INORGANIC CHEMISTRY (9P1)

I Spectrophotometry:

1. Estimation of manganese.
2. Estimation of chromium.
3. Simultaneous determination of Manganese and Chromium in a mixture.
4. Spectrophotometric Titrations of (i) Cu(II) with EDTA (ii) Bi(III) with EDTA (iii) Fe(II) with o-Phen
5. Determination of composition of Complex by Job's Method and Mole ratio Method in the following:
(i) Cu(II)-EDTA (ii) Fe(II)-Bipyridyl (iii) Fe(II) with o-Phen

II pH-metry:

1. Determination of CO_3^{2-} and HCO_3^- in a mixture
2. Determination of the dissociation constants of
(i) Ethylenediamine (en)(H_2L) (ii) Glycine (HL) (iii) Histidinemonohydrochloride (H_2L)
3. Determination of binary constants of i) Cu(II) -en and (ii) Ni(II) -His iii) Ni(II) – Gly Systems.

II. Characterization of metal complexes using different physicochemical and spectroscopic methods- two or three examples involving following methods.

- i) Estimation of metal ions and counter ions
- ii) Conductance measurements
- iii) Thermal methods (TGA & DSC)
- iv) IR, UV- Visible, NMR, ESR spectra

References:

1. Text Book of Quantitative Inorganic Analysis Jaffery et al 4th edn. EdnElbs Publication
2. A Text Book of Quantitative Inorganic Analysis by A.I. Vogel 3rd EdnElbs Publication 1969.
3. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn.
4. Analytical Chemistry Thoery and Practice by R.M. Verma 3rd Edn.CBS Publishers & Distrbutors1994.
5. Practical Pharmaceutical Chemistry, A.H. Beckett and J.B. Stenlake 4thedn. CBS publishers, 2001
6. Medical Laboratory Technology – Mukherjee,Mc Graw Hills,1988
7. Vogel's Text Book of Quantitative Chemical Analysis, 6th edition. Pearson Education Ltd 2002.
8. Determination and use of Stability Constants – Martell and Motekaitis VCH Publishers INC, 1988.
9. Metal Complexes in Aqueous Solutions A.E.Martell and R.D. Handcock, Plenum Press, New York – 1996.
10. Analytical Chemistry by Gary D.Christian 6th EditionJohn Wiley&Sons Inc New York 19

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PAPER-V: PESTICIDES (10T5)- (Elective Paper)

15 Hrs

i) Definition, classification and importance of pesticides. ii) Different methods of pest control - Chemical - Insecticides, fungicides, Herbicides, Rodenticides, Fumigants, Chitin synthesis inhibitors and insect repellents. a) Biological- - pheromones: Definition and classification, synthesis of Disparlure, Exobrevicomin, Endobrevicomin, frontaline and grandisole pheromones, synthetic sex attractants; b) Insect juvenile hormones: JH-A, JH-B, synthesis of juvabione. Structural formula and importance of Methoprene. c) Moulting Hormones-- Structural formula and mode of action of Ecdysones. d) Antibiotics and secondary metabolites of microbial origin as insecticides and fungicides in agriculture. Structural formula and importance of Blasticidin-S, Kasugamycin, Avermectin B, Invermectin, piericidins and phytoalexins. iii) Environmental pollution from pesticides iv) integrated pest management . v) Pesticide formulations: Dusts, Granules, Wettable powders, Emulsions and Aerosols.

15 Hrs

i) Organochlorine insecticides - synthesis and mode of action of methoxychlor, perthan, Dicolfol, Heptachlor, Dieldrin and Endosulfan. ii) Organophosphorous insecticides -- synthesis and mode of action of phosdrin, Dichlorophos, parathion, Fenitrothion, Systox, Metasystox, Malathion, Thimex, Phosalone, Asinphosmethyl, TEPP and Schradan. iii) Carbamate insecticides - synthesis and mode of action of Carbaryl, Furadan, Baygon, Aldicarb and Zectron. iv). Formulation and residue analysis of organochlorine, organophosphorus and carbamate insecticides

15 Hrs

- i) Insecticides of plant origin - synthesis and importance of pyrethrins, Rotenone and Nicotine. Main constituents of Neem - Structural formula of Azadirachtin. Synthesis of polygodial and Warbutiganol (Antifeedants).
- ii) Synthetic pyrethroids- Synthesis of Allethrin, Bioallethrin, Permethrin, Cypermethrin, Fenvalerate, Decemethrin and Pyrethrelone.
- iii) introduction to Bioinsecticides - *Bacillus thuringiensis*.
- iv) Concept of proinsecticides - structure and mode of action of propheromones and preproinsecticides.

15 Hrs

1) Fungicides - classification, synthesis applications and mode of action of the following classes: (a) Carbamates (b) Quinones - Chloranil, Dichlone and Benquinox (c) perchloromethylmercaptan derivatives - captan, Folpet, Difolatan and Mesulfan. (d) Benzimidazoles - carbendazim, Benomyl and Thiabendazole. ii) Herbicides - synthesis, applications and mode of action of the following: (a) Aiyloxyalkyl carboxylic acid derivatives: 2,4-D), MCPA, 2,4,5-T and 2,4,5- TP. (b) Carbamates - protham and chlorprotham . (c) Urea derivatives - Monuron and Diuron. (d) Aliphatic acids - Dalapon, TCA . (e) Aromatic acids - 2,3,6-TEA, Dicamba and Amiben. (f) Nitrogen heterocyclic derivatives - Simazine, Atrazine, Aznitrole, Maleic hydrazide; Diquat and paraquat (g) Phenols - PCP and Dinoseb. (h) Benzonitrile compounds. (I) Miscellaneous herbicides

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Recommended Books:

22. Organoprosphorous pesticides : M.Eto

SEMESTER – X (Theory)
PAPER–VI: ~~PRINCIPLES~~ (10T6)-(Elective Paper)
Computational Chemistry.

MM - 01: Computational Chemistry – I

(15hrs)

Introduction to Molecular Modeling, Single molecule calculations, assemblies of molecules and reactions of molecules - Co-ordinate systems, Cartesian and internal Co ordinates, Z-matrix, Potential energy surface - Conformational search - Global minimum, Local minima, Conformational analysis of ethane.

Force field - Features of Molecular Mechanics –Bonded and Non bonded interactions. Bond Stretching – Angle Bending, Torsional Terms – Improper Torsions and out of Plane Bending Motions – Cross Terms. Non Bonded Interactions – Electrostatic Interactions - Van-der Waals interactions - Hydrogen Bonding, Miscellaneous interactions.

MM-02: Computational Chemistry - II

(15hrs)

Force Field Equation in Energy minimization (Energy as function of r , θ , ω) and variation w.r.t ω only - Introduction to Derivative Minimization Methods – First Order Minimization – The steepest Descent Method – Conjugate Gradients Minimization – Conformational Search procedures - Geometry optimization procedures - Introduction to molecular dynamics–description of molecular dynamics- basic elements of monte carlo method-differences between molecular dynamics and monte carlo method. Qualitative (brief) exposure to molecular dynamics simulations, conformational analysis.

MM- 03: Drug Design Methods I - Ligand Based

(15hrs)

Lead Molecule - Structure Activity Relationship (SAR) –~~QSAR~~ Physicochemical parameters, Hydrophobicity, Electronic effects, Steric Factors: Molar refractivity, Verloop steric factor and other physicochemical parameters .

Methods used in QSAR studies- Correlation of Biological activity with physico chemical Parameters – Application of Hammett equation, Hansch analysis, significance of slopes and intercepts in Hansch analysis. QSAR- 2D

Linear Free Energy Relationship (LFER) - Craig plot - Topliss scheme - Bioisosteres - ree-Wilson approach - Molecular Descriptor analysis - Structure representation – QSAR 3D, CoMFA, CoMSIA.

MM- 04: Drug Design Methods II - Structure Based.

(15hrs)

Database similarity searches - Pair-wise alignment - Dot matrix comparison Needleman - Wunsch Global sequence analysis - Smith waterman Local Sequence Alignment - Multiple Sequence Alignment - Homology Modeling - Energy minimization methods - Active site Identification - Virtual Screening - SmallmoleculeBuilding - Docking Algorithms - Docking Analysis. De novo Ligand design.

References:

1. Molecular Modelling: Principles and Applications, by Andrew Leach, Longman

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