



KRISHNA UNIVERSITY
Machilipatnam-521001



INFORMATION BROCHURE

KRUCET-2019

(for Admissions into PG Courses offered by Krishna University Campus College, Machilipatnam, Krishna University Dr.MRAR PG Centre, Nuzvid and Colleges Affiliated to Krishna University)



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**KRISHNA UNIVERSITY, MACHILIPATAM-521001
(KRUCET-2019)**

NOTE -1: SCHEDULE OF KRUCET – 2019		
Cost of Application : Rs. 500/- (Rs. 400 for SC/ST/PHC)		
1	Notification Released on	09-03-2019
2	Commencement of Submission of Online Applications	09-03-2019
3	Last date for submission of Online Applications without Late Fee	30-04-2019
4	Last Date for submission of Online Applications with Late fee of Rs.250/-	05-05-2019
5	Schedule of Entrance Tests (Tentative)	13-05-2019 To 16-05-2019
6	Downloading Hall-Tickets from website (www.krudoa.in)	07-05-2019
7	Date of Publication of Result	17-05-2019

NOTE – 2 : List of enclosures	
The following Original Certificates are to be submitted at the Time of Counseling	
1	KRUCET – 2019 Application, Hall Ticket
2	KRUCET – 2019 Rank Card
3	Transfer Certificate & Conduct Certificate from the college last studied
4	Degree Provisional Certificate / Original Degree
5	Degree Mark Memos of Three Years
6	Reserved / Permanent Caste Certificate issued from Mee Seva (for SC, ST BC and EBC Candidates if reservation is claimed)
7	S.S.C / Date of Birth Certificate
8	Intermediate or equivalent Certificate
9	Income Certificate issued in 2019 from Mee Seva/White Ration card (if fee concession is claimed, once issued the income certificate it is valid for 4 years)
10	Study Certificates (from 9 th Class to Degree final year) / Residence Certificate of last Seven Academic Years (from Mee Seva issued in 2019) / Form-I or II or III or IV as given in Annexure - A pertaining to claim of Local Candidate
11	Copy of the Relevant Certificates issued from concerned authorities if Special Reservation is claimed under PH/ NCC/ SPORTS/ CAP
12	Migration Certificate (Student studied other than Krishna University)
13	Declaration form as given in Annexure-B
14	Two sets Xerox copies of above mentioned certificates and Two Passport size photos
<u>No Candidate will be allowed into the Counselling Hall/ Certificate verification without Provisional Certificate (P.C) and Transfer Certificate (T.C).</u>	
NOTE: Candidates admitted through KRUCET–2019 PG Entrance Test and Counseling are eligible for Fee Reimbursement as per the norms of Government of Andhra Pradesh.	

KRISHNA UNIVERSITY POST GRADUATE COMMON ENTRANCE TEST-2019 (KRUCET-2019)

I. GENERAL :

- Directorate of Admissions, Krishna University, Machilipatnam, invites applications from the eligible candidates for admission through Krishna University Entrance Test (KRUCET-2019) into various Courses offered in Campus College of Krishna University, Machilipatnam, Krishna University Dr. MRAR P.G Centre, Nuzvid, and Colleges affiliated to Krishna University offering P.G. Courses for the academic year 2019-20.
- Candidates seeking admission are advised to go through the Krishna University Admission Information Brochure carefully before filling the online application form of KRUCET-2019. Proper care should be taken while filling the respective categories of reservation in Online Application form.
- Candidates who have already passed their qualifying degree examination or who have appeared / appearing for the annual examination in 2019 only are eligible for KRUCET-2019. However, candidates qualified in advanced supplementary examinations of 2019 are also eligible.
- Eligibility criteria for different courses and different Tests to be conducted are given in the Krishna University Admission Information Brochure. Candidates from other recognized universities are considered for admission into PG courses only, if they possess a three year Bachelor Degree in the pattern of 10+2+3 or in 12+3 or in 11+1+3 pattern, with the prescribed minimum percentage of marks.
- Allowing a candidate for KRUCET-2019 does not guarantee the right of admission into any course of study. A candidate must satisfy the eligibility criteria as prescribed in the Admission Information Brochure. Candidates obtaining admission by furnishing false information are liable for prosecution and cancellation of seats. The decision of the Directorate of Admissions is final in all respects.
- Requests for inclusion or change of test, test centre and / or reservation category (ies) once filled will not be entertained under any circumstances. The Online applications will be processed as per the information furnished by the candidates only.
- Candidates who have already studied a P.G. course are not eligible to write the test leading to admission into the same course. Such candidates are liable for disciplinary action as per the rules of university.
- The university reserves the right whether to fill or not to fill the seats earmarked for a particular course. All admissions are purely provisional and the university reserves the right to cancel the admission at any stage. Further it also reserves the right to run or not to run a particular course depending on the number of candidates joined in it.
- Medium of instruction for all PG courses except languages offered will be in English. Hence the candidates must write the examinations in English only.
- Krishna University reserves the right to: (i) allot a Centre other than the candidate's choice, (ii) conduct or not to conduct any test and (iii) cancel a Test/Test Centre based on the number of candidates opted for the Test / Test Centre.

- All disputes pertaining to KRUCET-2019 shall fall within the jurisdiction of Machilipatnam only.
- Admission into P.G. Courses in Krishna University Campus, Krishna University Dr. MRAR PG Centre, Nuzvid and Affiliated Colleges for the Academic Year 2019-20 will be made for courses mentioned in Appendix-II.
- Fee structure is subject to final decision of the high power committee on rationalization for P.G. Courses. GS-General Seats; SF-Self Finance Seats
- Separate Online application should be submitted for each course even though eligibility criteria are fulfilled. However, a single online application is enough for each course for admission into the University College / PG Centre / Affiliated Colleges.
- Online Application must be filled together with all required enclosures
- No Notice will be taken of any communication(s) or document(s) sent separately.
- Submission of incorrect information or suppression of information or forgery of signatures or fabrication of certificates or other fraudulent methods will entail cancellation of seat without notice.
- Applicants are advised to fill the marks in the columns specified in the online application form carefully.
- Incomplete or defective online applications will not be accepted.
- In addition to the marks obtained in the qualifying examination, admission is subject to the general rules and conditions of the University.
- Candidates selected for the Counseling will be informed by the Email id (or) SMS and each candidate is advised to check from the websites.
- If any candidates fails to report to the admitting authorities when his/her rank/ name is announced, he/she will be considered for admission at the end of that session/day subject to availability of seats.
- The University cannot accept any explanation for any delay in reporting to the allotting authorities and a student forfeits his/her right to admission based on his/her rank if he/she fails to respond to the call during the counseling with all the necessary original certificates.

II. IMPORTANT INSTRUCTIONS:

- ❖ Separate Application must be submitted for each test/course.
- ❖ Admissions into the courses listed in Krishna University Campus College, Krishna University Dr. MRAR PG Center, Nuzvid and Krishna University affiliated colleges will be made on the basis of the rank obtained in the entrance test.
- ❖ Candidates who have completed their qualifying examination or appeared for the final year examination in March/April 2019 are eligible to appear for the entrance test.
- ❖ There is no provision for revaluation, retotaling or personal verification of scripts of Entrance Tests.
- ❖ All candidates who apply for entrance test satisfying the eligibility criteria will only be allowed for appearing the Entrance test.
- ❖ Allowing a candidate for the Entrance Test does not provide any claim or right for admission into P.G. Courses. They have to satisfy the eligibility criteria given. The decision of admitting authority is final in all such matters.

- ❖ Selected candidates (who are given ranks) should produce all the original certificates along with two sets of attested photocopies of certificates listed to the counseling/Certificate verification. Otherwise they will forfeit their seats.
- ❖ Incomplete application will not be considered. No notice will be taken in respect of any communication(s) or document(s) sent by the candidates after the submission of his/her application.
- ❖ Candidates admitted to KRUCET-2019 and subsequently getting admission by furnishing false/incorrect information/indulging into any other kinds of fraudulent methods are liable for prosecution and cancellation of their admission without notice.
- ❖ There is no age limit for the admission into any PG Courses however those candidates who crossed the age of 30 years for OC, 34 years for BC, SC and ST are eligible for claiming / applying any fee reimbursement (as per memo no. 10537/ SW.Edn. 2/2011, dated 01/11/2011).
- ❖ PG Degree holders of a particular course/ subject are not entitled for admission into the same course/subject in Krishna University and its affiliated colleges. However a PG Degree holder who wishes to pursue another PG Course in a different discipline may be given admission but not eligible for any scholarship/exemption of any fee applying for reimbursement etc.,.
- ❖ No candidate is entitled to pursue more than one full time course at a time. If admitted, no candidate can undertake any other full time assignment / employment / study of any other full time course simultaneously.
- ❖ Hall ticket should be retained by the candidate even after the entrance test as it is required at the time of counseling for admission through KRUCET-2019.

III. HOW TO APPLY:

1. The application should be submitted ONLINE only at the website www.krudoa.in, www.krishnauniversity.ac.in by registering the name and other details.
2. A Separate registration is required for each test. No change of subject shall be entertained at any stage.
3. Candidates should ensure uninterrupted power supply and internet connectivity before filling the application and making the payment online.
4. For speedy processing of application, candidates should keep a scanned copy of their latest passport size photo and signature in JPEG/ JPG format only with less than 100KB in size.
5. A Candidate has to carefully fill online application along with all the enclosures. correct mobile number and Email address should be given so that all information will be sent to mobile or mail ID.
6. Read the eligibility conditions given in the prospectus for the test to be taken and ensure your eligibility before applying.
7. The following information must be kept ready for filling the details Online submission:
 - i. Select the eligible courses.
 - ii. Hall-Ticket Number of Qualifying Examination.
 - iii. Percentage of marks and year of Passing of Qualifying Examination, if passed.

- iv. Date of Birth as per SSC records.
- v. Caste in case of SC / ST / BC/EBC candidates.
- vi. PH / NCC / SPORTS / CAP etc.
- vii. Study or Residence (from M.R.O) or relevant certificate for proof of local status.

IV. GENERAL INSTRUCTIONS:

- a. Admissions are made under semester system of examinations without supplementary examinations, and with an internal assessment component.
- b. University does not provide any transport facilities for any purpose. However, students can make use of the concessional APSRTC student bus pass facility.
- c. Examinations will be conducted as per University schedules and will not be postponed under any circumstances.
- d. 75% attendance of classes is compulsory. Condonation may be granted to only those who have put in at least 60% of attendance on production of evidence with sufficient ground.
- e. If a student discontinues a course after admission, he/she will not be readmitted into the course later.
- f. A student's name will be removed from the rolls without any notice if he/she is absent continuously for a period of one month.
- g. Students of this University are prohibited from simultaneously pursuing another full time course of study here or elsewhere or employment or profession.
- h. Transfer Certificate (T.C.) and Conduct Certificate (C.C.) once submitted will not be returned.
- i. Candidates claiming reservation under S.C., S.T. and B.C. EBC categories are advised to submit the correct caste certificate and income certificate. If any information furnished in this regard is found to be incorrect at a later date, the candidate will forfeit the seat and will be liable for prosecution.
- j. Students who are eligible for scholarships may get scholarship for a maximum period of 10 months in an academic year. They are neither eligible for vacation money nor scholarship beyond ten months in an academic year. The University makes no commitment towards any scholarship amount due from the Government.
- k. Admissions are according to the rules and criteria made from time to time by the authorities of the University.
- l. The University reserves the right to cancel or postpone the admission into any course.
- m. Duly filled in declaration form given an Annexure-D should be submitted along with the application.
- n. If any student is found responsible for defacing the walls or any permanent structures within the campus or destruction of University property he/she is liable for expulsion from the University.

V. ENTRANCE TEST:

Admissions will be given on the basis of the rank obtained by the candidate in the Entrance Test KRUCET-2019, conducted by Krishna University, subject to the fulfilment of eligibility criteria.

VI. TEST CENTERS:

- | | | | |
|-------------|---------------|-----------------|------------------|
| 1 Nandigama | 2. Vijayawada | 3. Vuyyuru | 4. Machilipatnam |
| 5 Gudivada | 6. Nuzvid | 7. Vissannapeta | |

- The candidate has to choose an examination centre from among the places mentioned above in online application form.
- Candidates applying for more than one test are advised to opt for the same centre as there is a possibility of overlap of dates for both the tests.
- Requests for the change of test Centre and subject opted by the candidate in the online application form will not be considered under any circumstances.
- The final allotment of the examination centre rests with the Director, Directorate of admissions.
- **The exact date, time and venue of test centre will be given along with the hall ticket.**
- **Candidate have to download their hall tickets and schedule of entrance examination from the Krishna University website www.krishnauniversity.ac.in or www.krudoa.in**

VII. HALL TICKETS:

- Hall tickets will not be sent to the candidates by post they have to download from the website www.krudoa.in or www.krishnauniversity.ac.in before the date of Entrance Test by making use of application number. In case any problem advised to contact the Director immediately through E-mail: dirkrudmissions@gmail.com, doakru@gmail.com. Facility of downloading hall tickets will also be arranged at the concerned examination Centre's. You may contact the Chief Superintendent of the examination centre one day before the Entrance Test on production of the following:
 - a. Proof of submission of online application form.
 - b. One attested passport photograph
 - c. Crossed Demand Draft for Rs. 50/- drawn in favour of Director, Directorate of Admissions, Krishna University, Machilipatnam.

VIII. CONDUCT OF ENTRANCE TEST:

- ✚ The syllabi for the entrance test can be had from Krishna University websites www.krishnauniversity.ac.in / www.krudoa.in
- ✚ Examination will be conducted through online process.
- ✚ No candidate will be admitted into examination hall without Hall-Ticket.
- ✚ There is a prescribed syllabus for each Entrance Test.

- ✚ Each Entrance Test will be of 90 minutes duration with 100 multiple choice questions. Each question will be for one mark and there will be no negative mark for a wrong answer. The question paper generally will consist of three sections viz., Sections A and B with 30 question each and Section C with 40 questions. In case of tie priority in ranking is given on the basis of marks obtained in Section C followed by Section B. For some subjects the number of questions may be less.
- ✚ Books / Tables / Mechanical / Electronic aids / Cell Phones / Mobile Phones/Pagers are not allowed in the Examination Hall. Possession of these items in the Examination hall is an offence and disciplinary action will be taken by the Chief Superintendent of the Examination center.
- ✚ Candidate will not be admitted into the Examination Hall after a lapse of **15 minutes** after commencement of the test. No candidate will be allowed to leave the Examination Hall before one hour after the commencement of the test.
- ✚ The Chief Superintendent of the Centre may take disciplinary action against candidates for violation of any of the examination rules or for indulging in malpractices. All cases of malpractices in the examination will be dealt in accordance with the University rules.

IX. RANKING / SELECTION FOR ADMISSION

- 1) All candidates who appear for entrance test will not be given ranking. Depending upon the availability of seats in a particular course, the University has the right to prescribe cut off marks for giving rank in that course.
- 2) Admission to a course will be based on KRUCET-2019 Rank, subject to the candidate fulfilling the other eligibility criteria.
- 3) The order of merit will be decided on the basis of marks obtained in the Entrance Test. In case of tie, priority in ranking is given on the basis of marks obtained in Section C followed by Section B in the entrance test. In case of a further tie between the candidates with same marks, the tie will be resolved on the basis of date of birth in favour of older candidates.
- 4) Candidates can download the Rank Card from the website www.krudoa.in/ www.krishnauniversity.ac.in after publication of the results (Rank cards will not be sent by post). In case the candidate requires a duplicate Rank Card, it will be issued on payment of Rs. 50/- by crossed D.D. in favour of Director Directorate of Admissions, KRUCET- 2019.
- 5) Admission of the candidate into any of the Courses is subject to the fulfilment of eligibility criteria besides obtaining rank in the entrance test.
- 6) The Rank obtained in KRUCET-2019 is valid for admission for the academic year 2019-20 only.
- 7) There is no provision for revaluation or personal identification of the answer sheet.
- 8) The University cannot accept any explanation for any delay in reporting to the allotting authorities and a student forfeits his/her right to admission based on his/her rank if he/she fails to respond during the counselling with all the necessary original certificates.
- 9) If any candidate fails to report to the allotting authority (Director, Directorate of Admissions) when his / her rank / Name is announced, he / she will be considered for

allotment at the end of that Session subject to availability of seats and no explanation for the delay in reporting to the allotting authority will be entertained.

X. INCOMPLETE APPLICATION:

- Incomplete/ineligible online applications will not be accepted and the Directorate is not obliged to send any communication to the candidate in this regard.
- Candidates admitted to Entrance test and subsequently getting admission by furnishing false/incorrect information are liable for prosecution and cancellation of their admission without notice.

XI. ADMISSION PROCEDURE

1. Admission to a course will be based on KRUCET-2019 Rank, subject to the candidate fulfilling the other eligibility criteria.
2. The candidate should have passed the qualifying examination with the minimum percentage of marks prescribed.
3. Candidates will be called for the verification of certificates. The schedule of certificate verification / counseling will be placed in the website after announcement of results.
4. Candidates have to appear for certificate verification at help line centers candidate should produce the following all the original certificates along with TWO sets of Photostat copies and TWO passport size photographs as per the schedule. If a candidate fails to produce any of the following certificates, he/she will not be considered for admission.
5. A candidate who fails to produce all the necessary certificates, particularly TC and CC, Marks Memo, Provisional Certificate and reservation category certificates at the time of verification will forfeit the chance.
 - KRUCET-2019 Hall Ticket and Rank Card.
 - Marks Statements and Provisional/Degree Certificate of the qualifying examination.
 - Transfer Certificate (TC) and Conduct Certificate(s).
 - SSC and Intermediate Pass Certificates.
 - Two passport-size photographs.
 - Study Certificates from IX class to the qualifying examination.
 - Caste certificate in original from Tahsildar in case of SC/ST/BC/EBC candidates (Integrated Caste Certificate or Temporary Caste Certificate taken in 2019, if taken earlier is enough).
 - Income Certificates from Tahsildar obtained in 2019(If taken earlier valid for four year only).
 - Relevant certificate in case of other reservations (PH/NCC/Games and Sports).
 - Discharge Certificate and Service Certificate of the parent in case of children of Armed Services Personnel.
 - Residence Certificate of parents for stay in the state of A.P. from Tahsildar in case of candidates who have studied outside AP / carried out private study.

➤ Migration Certificate (for other than KRU region candidates).

6. Candidates have to attend the certificate verification on the date and time prescribed at their own expense with the required original documents.
7. If a candidate fails to attend the verification session on the specified date and time of the subject for whatever reason, he/she will forfeit the opportunity in that phase. However, he/she can attend the next phase of verification, if any. If a candidate attends on the subsequent phase of verification, he/she may be considered for the vacant seats available at that time.
8. Any representation for postponement of the date and time or exemption from personal appearance will not be entertained.
9. The cases of pending revaluation / results will not be considered.
10. Instructions regarding admissions counseling shall be made available in the website along with the admission counseling schedule.
11. Candidates, who are not satisfied with the first phase of allotment and wish to appear for the second phase, need not pay the course fee and report to the allotted college. They can appear for the second phase of verification. In such cases, the allotment of first phase stands cancelled and the allotment in second phase is subject to availability of seats, merit and rule of reservation.
12. For the purpose of reimbursement of fee, the Income certificate is invariably to be issued by M.R.O. If the Original Certificates are not submitted at the time of counseling he / she has to pay total prescribed fee on par with the candidates of other categories and no concession will be allowed by the allotting authority.
13. The income certificate of the parent/guardian issued by M.R.O. is valid, if it is issued valid for four year from the issued date, it is also valid at the time of counseling date.
14. The Fee Reimbursement is limited to the extent of **Rs.20, 000/-** only (wide G.O. M.S. 56, S.W. Edn.-2. Dept dated 6.10.2003) and if the fee is over and above Rs.20,000/- the remaining amount has to be paid at the time of counseling failing which he/she has to forfeit the seat.
15. All the admissions are purely provisional and the University reserves the right to cancel the admission of a candidate at any stage.

XII. COUNSELLING FEE:

1. Certificate verification fee and processing fee will be intimated at the time of counselling on the website www.krudoa.in, www.krishnauniversity.ac.in .

XIII. SLIDING:

- ✓ A candidate after allotment in a college will be allowed for sliding into another college subject to availability of seat in another college on payment of sliding fee Rs.300/-
- ✓ Sliding is restricted for two times for any candidate
- ✓ For second sliding, the candidate is required to pay an amount of Rs.500/-
- ✓ No further sliding will be allowed under any circumstances.

- ✓ A candidate once opted for a course and allotted will be allowed to change the course which he/she already opted, subject to availability of seats on payment of cancellation and readmission fee basing on the availability of seats . The change of course will be allowed only on the basis of KRUCET rank.

XIV. CANCELLATION

- ✓ A candidate after getting allotment of the seat in a course will be required to join the college on or before the given time frame for reporting at the allotted college. If not reported at the allotted college allotment will be cancelled without any information.
- ✓ The Processing fee will not be refunded under any circumstances. All the cancellations will be after paying the 15 % of the tuition fee. Those who already paid amount will be refunded after **deducting 15%** of the tuition fee prescribed for that course.
- ✓ However, cancellation of seat is allowed only before the closure of the admissions for the academic year **2019-20**.

XV. GENERAL ELIGIBILITY CONDITIONS FOR ALL COURSES:

- The candidates should satisfy the prescribed academic eligibility criteria for the respective courses as given under specific eligibility criteria. Candidates should submit all the original certificates in support of their eligibility at the time of certificate verification / counselling failing which the candidates will forfeit the claim for admission.
- Candidates who have already completed one P.G. course (Professional or non Professional) will not be considered for any type of scholarship whatsoever, as per G.O.s. in force. As per Govt of A.P. Social Welfare (Edn) Department Memo No. 10537 / Sw. Edn. 2/2011 dated: 01.11.2011. The Maximum eligible age for obtaining scholarship in respect of SC, ST and BC is 34 years and in respect of EBC / Minorities / Disabled is 30 years for PG and above courses.
- P.G. admissions are made under **Choice Based Credits System in Semester Pattern** with an internal component of 30%, without any supplementary examinations.
- University does not provide any transport facilities for any purpose. However, students can make use of the concessional APSRTC student bus pass facility.
- 75% attendance of classes is compulsory. Condonation may be granted to only those who have put in at least 60% of attendance on production of evidence with sufficient ground.
- If a student discontinues a course after admission, he/she will not be readmitted into the course later.
- The student name will be removed from the rolls without any notice if he/she is absent continuously for a period of one month.
- Students of this University are prohibited from simultaneously pursuing another full time course of study here or elsewhere or employment or profession.
- Transfer Certificate (T.C.) and Conduct Certificate (C.C.) once submitted will not be returned.
- If any student is found responsible for defacing the walls or damaging any permanent structures within the campus or destruction of University property he/she is liable for expulsion from the University/need to compensate the financial loses / liable for punishment under Law and Order.

- KRU Campus is **Ragging Free Zone** and if any student is indulging in the act of Ragging, he / she is liable for prosecution as per **ANDHRA PRADESH ANTI RAGGING ACT XXXVI OF 1997**

XVI. RESERVATIONS

Admission to various courses of study will be made on the basis of merit, subject to the following reservations.

A) **Local Candidates:** 85% of the available seats in each category in every course of study are reserved in favour of the local candidates. Candidates claiming reservation under this category shall enclose a local candidate certificate in the appropriate form given in Annexure-B.

B) Other Category Reservations:

i)	Scheduled Caste (SC)	: 15%
ii)	Scheduled Tribes (ST)	: 06%
iii)	Backward Communities (BC)	: 29% (A-7%; B-10%; C-1%; D-7%; E-4 %)
iv)	Physically Handicapped (PH)	: 03%
v)	EBC	: 10% (as per the existing rules at the time of Counseling)
vi)	Sports	: 0.5%
vii)	NCC	: 01%
viii)	CAP (Children of Armed Personnel)	: 02%
ix)	Women	: 33.3% in OC and in each of reservation Categories

The rules of reservation that are in force at the time of counseling shall apply to all the categories .

Note:

- ❖ S.C., S.T., B.C., and EBC candidates should submit the caste certificate in original as given in Annexure-A (Form-I or II whichever is applicable) certificates by Mandal Revenue Officer / Attested Photostat copy of permanent caste certificate.
- ❖ Physically Handicapped candidates should submit the certificate of their disability issued by the concerned specialist government doctor (Professor's rank) / Medical Board.
- ❖ For claiming admission under N.C.C and Sports quota the candidates submit relevant Certificates.
- ❖ In case of CAP, the certificates, issued by the Zilla Sainik Welfare Officer in respect of Ex-service and service certificate in respect of those in service, will alone be considered.

XVII. Refund of Fee:

- i. Refund of Fee in respect of payment seats and self finance courses will be made as per the University rules in vogue.

- ii. Fee concession for SC and ST candidates will be allowed (subject to conditions of self financing courses) as per G.O's issued by the Government on submission of original caste and income certificates issued by Mandal Revenue Officer only. Candidates have to submit the caste and income certificates issued by Mandal Revenue Officer, failing which no concession will be given at the time of admission. The **income certificate is valid for four year from the date of issue**. Eligible candidates are entitled for reimbursement of fee which is limited to Rs. 20,000/- (G.O. M.S. 56, S.W. Edn.-2. Dept dated 6.10.2003.)
- iii. If the fee to be paid by such candidates is more than Rs. 20,000/- they have to pay remaining amount of fee at the time of admission itself.
- iv. No time for production of income certificate at a later date or payment of remaining amount of money will be given.

Note:- Fee structure is subject to final decision of the high power committee on rationalization for P.G. Courses will be intimated in the university website.

Appendix - I

Courses offered through KRUCET-2019 along with Eligibility Criteria

COURSES OFFERED AND ELIGIBILITY CRITERIA FOR ADMISSION				
Test Code	Test Name	Course Code	Course Name	Eligibility
101	LIFE SCIENCES	10101	M.Sc., Biochemistry	B.Sc., with Chemistry or Biochemistry or B.Sc., (MLT) as one of the subjects.
		10102	M.Sc., Biotechnology	Bachelor's Degree in Physical/Biological Sciences/B.Sc. in Farm Science/B.Sc., Ag./B.V.Sc./Bachelor's Degree in Medicine or Pharmaceutical Science/ B.E/B.Tech.
		10103	M.Sc., Botany	B.Sc., with Botany and Chemistry as the two of the common Core subjects or B.Sc., with Botany as main and Chemistry as ancillary.
		10104	M.Sc., Zoology	B.Sc., with Zoology as one of the subjects
		10105	M.Sc., Microbiology	B.Sc., with Microbiology or Botany as one of the three subjects and Chemistry or Biochemistry as another subject
102	PHYSICAL SCIENCES	10201	M.Sc., Physics	B.Sc. Mathematics, Physics and any other third subject under common core scheme.

		10202	M.Sc. Electronics and Instrumentation	Electronics/ Computer Science/ Instrumentation. Passed/ Appeared in B.Tech. Electronics, B.Tech (Computer Science), B.E. (Electronics)/B.E. (Computer Science), B.Tech (Instrumentation), etc.
		10203	M.Sc. Electronics	A pass in B.Sc., with Mathematics, Electronics as the subjects of equal importance.
103	MATHEMATICAL SCIENCES	10301	M.Sc., Applied Mathematics	B.Sc., or B.A. with Mathematics as one of the three equal subjects or as main subject
		10302	M.Sc., Mathematics	B.Sc., or B.A. with Mathematics as one of the three equal subjects or as main subject
		10303	M.Sc., Statistics	B.Sc. /B.A with both Statistics and Mathematics.
		10304	M.Sc., Computer Science	A pass in any Graduate program with computers as one of the subjects of study.
		M.Sc. Chemistry with the following specializations		
104	CHEMICAL SCIENCES	10401	M.Sc., Pharmaceutical Chemistry	B.Sc., with Chemistry as main or one of the three equal subjects in common core system/B.Pharmacy.
		10402	M.Sc., Analytical Chemistry	B.Sc., with Chemistry as main or one of the three equal subjects in common core system
		10403	M.Sc., Inorganic Chemistry	
		10404	M.Sc., Organic Chemistry	
		10405	M.Sc., Physical Chemistry	
105	HUMANITIES & SOCIAL SCIENCES	10501	M.Com.	All B.Com Graduates
		10502	M.A. Economics	B.A. with Economics as one of the Subjects.
		10503	M.A. History	B.A with .History or B.A.(O.L) or B.A.L.
		10504	M.H.R.M.	Any Graduate
		10505	M.A. Journalism and Mass Communication.	
		10506	M.A. Sociology	Any Graduate
		10507	M.A. Psychology	(i) 50% seats to B.A. /B.Sc. Course with psychology as one of the paper or specialization. (ii) 50% seats to any other degree Recognized by Andhra University. (iii) Any unfilled seats in any category may be filled by other

				category.
		10508	M.Ed.	B. Ed.,
		10509	M.A. Social Work	Any Graduate
		10510	M.A. English	B.A., / B.Sc.,/B.Com./B.B.M./B.C.A / B.A. (O.L.) in telugu / B.A. (O.L.) Sanskrit with general English, Degree in Hotel Management, B.A. with special English in the group subjects.
		10511	M.P.A. Kuchipudi Dance	Any graduate, with certificate course in Traditional dance
106	TELUGU	10601	M.A. Telugu	B.A. special Telugu, B.A.O.L. Telugu, B.A.O.L. Sanskrit, B.A., / B.Sc., / B.Com.B.B.M/B.C.A with Telugu under Part I or Part II, BOL Telugu/ Bhasha Praveena with POL.
107	PG DIPLOMAS	10701	P. G. Diploma in Kuchipudi dance (Sutradhār)	Any Degree and a certificate course (or) diploma in Kuchipudi Dance
		10702	P. G. Diploma in Water and Waste Water treatment technology	Intermediate with Science Background subjects
		10703	P. G. Diploma in Aquaculture technology and management	Intermediate with Science Background subjects
		10704	P. G. Diploma in E-Banking	Any Degree
108	DIPLOMAS	10801	Diploma in Kuchipudi Dance	Intermediate and a certificate course in Kuchipudi Dance (or) its equivalent
		10803	Diploma in Yoga for Human excellence	Intermediate and a Certificate course in Yoga
109	CERTIFICATE COURSES	10901	Certificate course in Kuchipudi dance	10 th Class
		10902	Certificate course in Yoga for Human excellence	10 th Class

Note. No entrance test for PG Diploma, Diploma and Certificate courses.

APPENDIX – II

COURSES OFFERED THROUGH KRUCET-2019

(List of Colleges of PG Affiliated to Krishna University, Machilipatnam)

M.Sc (Organic Chemistry)		
S. No.	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	36
2	KRU Dr. MRAR PG Center, Nuzvid	36
3	Govt. Degree College, Tiruvuru	30
4	Noble College, Machilipatnam	30
5	Sri Krishnaveni Degree Kalasala, Vijayawada	30
6	D.A.R College, Nuzvid	30
7	Vikas Degree College, Vissannapeta	30
8	SRR & CVR Govt. Degree College, Vijayawada	30
9	Vidyanjali Degree & PG College, Kaikaluru	30
10	Pavitra Degree College, Machilipatnam	30
11	Sai Degree College, Tiruvuru	30
12	A.G & S.G.S College, Vuyyuru	30
13	Narayana Memorial Degree College, Kanchekacherla	30
14	Krishnaveni Mahila Kalasala, Vijayawada	30
15	S.V.L.Kranthi Degree College, Avanigadda	30
16	M.V.R Degree College, Nuzvid	30
17	D.V.R College, Nandigama	30
18	Andhra Loyola College, Vijayawada	30
19	Chaitanya Degree College, Nandigama	24
20	S.G.S College, Jaggaiahpetta	30
21	Siddhartha PG College of Science & Computers, Nuzvid	30
22	K.V.R College, Nandigama	30
23	Prabhas Degree College, Vijayawada	30
24	MRR College, Nandigama	30
25	KBN College, Vijayawada	30
26	Sri Srinivasa Degree College, Vuyyuru	30
27	Vignan Degree College, Vissannapeta	30
28	Sree Vidya Degree College, Gudivada	30
29	ANR College, Gudivada	30
30	P.B. Siddhartha College of Arts & Science, Vijayawada	30

M.Sc (Mathematics)		
S. No	Name of the Course/ College	Intake
1	KRU Dr. MRAR PG Centre, Nuzvid	40
2	Nova Degree & PG College, Vijayawada	30
3	Suguna Degree College, Kalidindi	40
4	Andhra Loyola College, Vijayawada	30

5	Montessori Mahila Kalasala, Vijayawada	30
6	V.S.R.Govt. Degree College, Movva	30
7	P.B. Siddhartha College of Arts & Science, Vijayawada	45
8	Maris Stella College, Vijayawada	30
9	ANR College, Gudivada	40
10	Vikas Degree College, Vissannapeta	40
11	SRR & CVR Govt. Degree College, Vijayawada	30
12	SDMSM Kalasala, Vijayawada	30

M.Com

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	40
2	KRU DR. MRAR PG Center, Nuzvid	40
3	Bishop Azaraiah Degree College, Vijayawada	40
4	Nova Degree & PG College, Vijayawada	40
5	S.G.S. College, Jaggaiahpetta	40
6	V.S.R.Govt.Degree College, Movva	40+40
7	The Hindu College, Machilipatnam	40
8	Prabhas Degree College, Vijayawada	40
9	P.B. Siddhartha College of Arts & Science, Vijayawada	40
10	Maris Stella College, Vijayawada	30
11	ANR College, Gudivada	50
12	SRR & CVR Govt. Degree College, Vijayawada	30+40
13	KBN College, Vijayawada	40
14	SDMSM Kalasala, Vijayawada	30
15	Gandhiji Mahila Kalasala, Vijayawada	40
16	A.G & S.G.S College, Vuyyuru	40
17	Govt. Degree College, Avanigadda	40

M.A. English

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30
2	P.B. Siddhartha College of Arts & Science, Vijayawada	40
3	Maris Stella College, Vijayawada	30
4	Vidyanjali Degree & PG College, Kaikaluru	40
5	SRR & CVR Govt. Degree College, Vijayawada	30
6	Vikas Degree College, Vissannapeta	40

M.A (Telugu)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30
2	Vikas Degree College, Vissannapeta	40

M.A. (Journalism & Mass Communication)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30

M.Sc. (Botany)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30
2	Andhra Loyola College, Vijayawada	24

3	SRR & CVR Govt. Degree College, Vijayawada	30
4	Vikas Degree College, Vissannapeta	30

M.Sc. (Zoology)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30
2	Vikas Degree College, Vissannapeta	30

M.Sc (Physics)

S. No	Name of the Course/ College	Intake
1	KRU Dr. MRAR PG Center, Nuzvid	36
2	Andhra Loyola College, Vijayawada	24
3	S.G.S College, Jaggaiahpetta	24
4	P.B Siddhartha College of Arts & Science, Vijayawada	30
5	ANR College, Gudivada	30
6	Sree Vidya Degree College, Gudivada	24
7	Vikas Degree College, Vissannapeta	30

M.Sc (Analytical Chemistry)

S. No	Name of the Course/ College	Intake
1	KRU Dr. MRAR PG Center, Nuzvid	36
2	Vidyanjali Degree & PG College, Kaikaluru	30
3	Vikas Degree College, Vissannapeta	30

M.Sc (Applied Mathematics)

S. No	Name of the Course/ College	Intake
1	KRU Dr. MRAR PG Center, Nuzvid	40

M.Sc (Statistics)

S. No	Name of the Course/ College	Intake
1	KRU Dr. MRAR PG Center, Nuzvid	30
2	ANR College, Gudivada	30

M.Sc (Biotechnology)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30
2	Andhra Loyola College, Vijayawada	30
3	Montessori Mahila Kalasala, Vijayawada	30

M.Sc (Pharamaceutical Chemistry)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30

M.A (Social Work)

S. No	Name of the Course/ College	Intake
1	Prabhas Degree College, Vijayawada	40
2	SRR & CVR Govt. Degree College, Vijayawada	30

M.A (Psychology)

S. No	Name of the Course/ College	Intake
1	SRR & CVR Govt. Degree College, Vijayawada	40

M.Sc. (Inorganic Chemistry)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	36

M.Sc. (Bio Chemistry)

S. No	Name of the Course/ College	Intake
1	KRU DR. MRAR PG Center, Nuzvid	30

2	Montessori Mahila Kalasala, Vijayawada	30
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M.Sc. (Physical Chemistry)

S. No	Name of the Course/ College	Intake
1	KRU Dr. MRAR PG Center, Nuzvid	36

M.Sc (Visual Communication)

S. No	Name of the Course/ College	Intake
1	Andhra Loyola College, Vijayawada	30

M.Sc (Microbiology)

S. No	Name of the Course/ College	Intake
1	Montessori Mahila Kalasala, Vijayawada	30
2	Prabhas Degree College, Vijayawada	30

M.Sc (Computer Science)

S. No	Name of the Course/ College	Intake
1	Montessori Mahila Kalasala, Vijayawada	30
2	Prabhas Degree College, Vijayawada	40
3	P.B. Siddhartha College of Arts & Science, Vijayawada	45
4	Maris Stella College, Vijayawada (M.Sc (Comp. Sci & Stat.))	30
5	ANR College, Gudivada	30
6	Vikas Degree College, Vissannapeta	40
7	SRR & CVR Govt. Degree College, Vijayawada	30
8	KBN College, Vijayawada	40
9	Vidyanjali Degree & PG College, Kaikaluru	30
10	Sai Degree College, Tiruvuru	30
11	V.S.R.Degree College, Mova	30
12	A.G. & S.G.S College, Vuyyuru	40

M.A (Economics)

S. No	Name of the Course/ College	Intake
1	V.S.R.Govt. Degree College, Movva	40
2	The Hindu College, Machilipatnam	50
3	Maris Stella College, Vijayawada	30
4	Govt. Degree College, Avanigadda	40
5	SRR & CVR Govt. Degree College, Vijayawada	30

M.Sc., Electronics and Instrumentation

S. No.	Name of the Course/ College	Intake
	Krishna University Campus College, Machilipatnam	30

M.Sc Electronics

S. No.	Name of the Course/ College	Intake
	KRU Dr. MRAR PG Center, Nuzvid	30

MHRM

S. No	Name of the Course/ College	Intake
1	Prabhas Degree College, Vijayawada	40

PG. Dipl in Kuchipudi Dance (Sutradhar)

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30

Dipl in Kuchipudi Dance

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30

Cert. Course in Kuchipudi Dance

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	30

PG. Dipl in Water and Waste Water Treatment Technology

S. No	Name of the Course/ College	Intake
1	Krishna University Campus College, Machilipatnam	18

E-Banking

S. No	Name of the Course/ College	Intake
1	KBN College, Vijayawada	30

Diploma In Printing Technology

S. No	Name of the Course/ College	Intake
1	KBN College, Vijayawada	30

Diploma in Yoga for Human Excellence (DYHE)

S. No	Name of the Course/ College	Intake
1	P.B. Siddhartha College of Arts & Science, Vijayawada	50

Certificate Course Yoga for Human Excellence (CYHE)

S. No	Name of the Course/ College	Intake
1	S.G.S College, Jaggaiahapeta	50

M.Ed

S. No	Name of the Course/ College	Intake
1	Vikas College of Education, Vissannapeta	50
2	Y.V.Rao Siddartha College of Education, Vijayawada	50
3	Nova College of Education, Ibrahimpatnam	50
4	A.J. College of Education, Machilipatnam	50
5	S.P.K.R College of Education, Mudinepalli	50
6	M.R.R.College of Education, Nandigama	50

APPENDIX - III

SYLLABI FOR ENTRANCE TEST FOR VARIOUS SUBJECTS

101- LIFE SCIENCES

Total Marks: 100

- 1. Cell Biology:** Ultrastructure of prokaryotic and eukaryotic cell, Structure and function of cell organelles. Cell division - Mitosis and Meiosis. Chromosomes structure, Karyotype.
- 2. Genetics :** Mendelian principles, Gene Interaction, Linkage and Crossing over, Sex determination, Sex linkage, Mutations - Genic and chromosomal (Structural and numerical); Chromosomal aberrations in humans. Recombination in prokaryotes transformation, conjugation, transduction, sexduction. Extra genomic inheritance.
- 3. Molecular Biology and Genetic Engineering:** Structure of eukaryotic gene, DNA and RNA structure, DNA replication in pro and eukaryotes, Transcription and translation in pro and eukaryotes, genetic code. Regulation of gene expression in prokaryotes, Principles of recombinant DNA technology. DNA vectors, Transgenesis. Applications of genetic engineering.
- 4. Biotechnology:** Plant and animal cell culture, cloning, Fermentors types and process, Biopesticides, biofertilizers, Bioremediation, Renewable and non - renewable energy resources, Non-conventional fuels.
- 5. Biomolecules:** Carbohydrates, proteins, amino acids, lipids, vitamins and porphyrins.

- Enzymes - classification and mode of action, enzyme assay, enzyme units, enzyme inhibition, enzyme kinetics, Factors regulating enzyme action.
6. **Immunology:** Types of immunity, cells and organelles of immune system, Antigen - antibody reaction. Immunotechniques, Hypersensitivity, Vaccines.
 7. **Techniques:** Microscopy - Light and Electron, Centrifugation, Chromatography, Electrophoresis, Calorimetric and Spectrophotometric techniques, Blotting techniques, PCR, DNA finger printing.
 8. **Ecology, Environment and Evolution:** Theories and evidences of organic evolution, Hardy - Weinberg law. Components of an ecosystem, Ecological pyramids, Biogeochemical cycles, Ecological adaptations. Climatic and edaphic and biotic factors. Ecological succession - Hydrosere and xerosere, Natural resources, Biodiversity, current environmental issues, Environmental pollution, Global warming and climate change.
 9. **Physiology:** Structure and function of liver, kidney and heart, composition of blood, blood types, blood coagulation, Digestion and absorption, Endocrinology, Muscle and Nervous system.
 10. **Metabolism:** Metabolism of carbohydrates, lipids, proteins, aminoacids and nucleic acids. Biological oxidation and bioenergetics.
 11. **Animal Science:** Biology of invertebrates and chordates, Embryology of chordates, Classification of marine environment - Physical and chemical parameters, Marine, estuarine, reservoir and riverine fisheries, Cultivation of fin and shell fish. Culture practices.
 12. **Plant Science:** Classification of cryptogams and phanerogams. General characteristics of taxonomic groups at class and family level Water relations and mineral nutrition of plants, Plant growth regulators, Ethnobotany and medicinal plants, Biology of plant seed, Photosynthesis.
 13. **Microbiology:** Microbes - Types, distribution and biology. Isolation and cultivation of bacteria and virus. Staining techniques. Bacterial growth curve, Microbial diseases - food and water borne, insect borne, contact diseases in humans. Microbial diseases in plants - by bacteria, fungi and virus, Plant microbe - interactions.
 14. **Nutrition:** Biological value of proteins, protein malnutrition, disorders, Chemistry and physiological role of vitamins and minerals in living systems.

102 - PHYSICAL SCIENCES

Total Marks: 100

Electricity, Magnetism and Electronics

1. **Electrostatics:** Gauss law and its applications-Uniformly charged sphere, charged cylindrical conductor and an infinite conducting sheet of charge. Deduction of Coulomb's law from Gauss law Mechanical force on a charged conductor Electric potential - Potential due to a charged spherical conductor, electric field strength from the electric dipole and an infinite line of charge. Potential of a uniformly charged circular disc.
2. **Dielectrics:** An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium- Relation between D,E, and P. Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric-needle shaped cavity and disc shaped cavity.
3. **Capacitance:** Capacitance of concentric spheres and cylindrical condenser, capacitance

of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser - force between plates of condenser, construction and working of attracted disc electrometer, measurement of dielectric constant and potential difference.

4. **Magnetostatics:** Magnetic shell - potential due to magnetic shell - field due to magnetic shell -equivalent of electric circuit and magnetic shell - Magnetic induction (B) and field (H) -permeability and susceptibility - Hysteresis loop.
5. **Moving charge in electric and magnetic field:** Hall effect, cyclotron, synchrocyclotron and synchrotron - force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot -Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid.
6. **Electromagnetic induction:** Faraday's law -Lenz's law - expression for induced emf - time varying magnetic fields -Betatron -Ballistic galvanometer - theory - damping correction - self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid -toroid - energy stored in magnetic field - transformer - Construction, working, energy losses and efficiency.
7. **Varying and alternating currents:** Growth and decay of currents in LR, CR and LCR circuits - Critical damping. Alternating current relation between current and voltage in pure R,C and L-vector diagrams -Power in ac circuits. LCR series and parallel resonant circuit-Q-factor. AC & DC motors-single phase, three phase (basics only).
8. **Maxwell's equations and electromagnetic waves :** A review of basic laws of electricity and magnetism - displacement current - Maxwell's equations in differential form - Maxwell's wave equation, plane electromagnetic waves -Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment).
9. **Basic Electronics:** Formation of electron energy bands in solids, classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation - p-n junction diode, Zener diode characteristics and its application as voltage regulator. Half wave and full wave, rectifiers and filters, ripple factor (quantitative) – p n p and n p n transistors, current components in transistors, CB.CE and CC configurations-transistor hybrid parameters-determination of hybrid parameters from transistor characteristics -transistor as an amplifier-concept of negative feedback and positive feedback -Barkhausen criterion, RC coupled amplifier and phase shift oscillator (qualitative).
- 10.**Digital Principles:** Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from Binary to Hexadecimal - vice versa and Decimal to Hexadecimal vice versa.
Logic gates: OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive - OR gate, De Morgan's Laws - statement and proof, Half and Full adders. Parallel adder circuits.

Modern Physics

1. **Atomic Spectra:** Introduction–Drawbacks of Bohr's atomic model–Sommerfeld's elliptical orbits–relativistic correction (no derivation). Stern & Gerlach experiment Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules. Spectra of alkali atoms, doublet fine structure. Alkaline earth spectra, singlet and triplet fine structure. Zeeman Effect, Paschen-Back Effect and Stark Effect

2. **Molecular Spectroscopy:** Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule, determination of internuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, Classical theory of Raman effect.
Experimental arrangement for Raman effect and its applications.
3. **Quantum Mechanics Inadequacy of classical Physics: (Discussion only)** Spectral radiation - Planck's law. Photoelectric effect - Einstein's photoelectric equation. Compton's effect (quantitative) experimental verification. Stability of an atom - Bohr's atomic theory. Limitations of old quantum theory.
4. **Matter Waves:** de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Broglie waves of electron in Bohr orbits.
5. **Uncertainty Principle:** Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Particle in a box. Complementary principle of Bohr.
6. **Schrodinger Wave Equation:** Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and potential barrier.
7. **Nuclear Physics Nuclear Structure:** Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p and n-p scattering (concepts), nuclear forces. Nuclear models - liquid drop model, shell model.
8. **Alpha and Beta Decays:** Range of alpha particles, Geiger - Nuttal law, Gammow's theory of alpha decay. Geiger - Nuttal law from Gammow's theory. Beta spectrum - neutrino hypothesis, Fermi's theory of p-decay (qualitative).
9. **Nuclear Reactions:** Types of nuclear reactions, channels, nuclear reaction kinematics. Compound nucleus, direct reactions (concepts). **Nuclear Detectors** - GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector

Solid State Physics

1. **Crystal Structure:** Crystalline nature of matter. Crystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, CsCl, FCC, NaCl diamond and Zinc Blends)
2. **X-ray Diffraction:** Diffraction of X-rays by crystals, Bragg's law, and Experimental techniques - Laue's method and powder method.
3. **Nanomaterials:** Introduction, Nan particles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures - nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.
4. **Bonding in Crystals:** Types of bonding in crystals - characteristics of crystals with different bindings. Lattice energy of ionic crystals - determination of Madelung constant for NaCl crystal, calculation of Born coefficient and repulsive exponent. Born - Haber cycle.
5. **Magnetism:** Magnetic properties of dia, para and ferromagnetic materials.

Langevin's theory of paramagnetism. Weiss' theory of ferromagnetism -Concepts of magnetic domains, antiferromagnetism and ferrimagnetism ferrites and their applications.

6. **Superconductivity:** Basic experimental facts - zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect Thermodynamic properties, specific heat, entropy. Type I and Type II superconductors. Elements of BCS theory- Cooper pairs. Applications. High temperature superconductors (general information)

Thermodynamics and Optics

1. **Kinetic theory of gases:** Introduction-Deduction of Maxwell's law of distribution of molecular speeds, Experimental verification Toothed Wheel Experiment, Transport Phenomena-Viscosity of gases-thermal conductivity - diffusion of gases.
2. **Thermodynamics:** Introduction - Reversible and irreversible processes - Carnot's engine and its efficiency -Carnot's theorem - Second law of thermodynamics, Kelvin's and Clausius statements -Thermodynamic scale of temperature - Entropy, physical significance - Change in entropy in reversible and irreversible processes - Entropy and disorder - Entropy of universe - Temperature- Entropy (T-S) diagram - Change of entropy of a perfect gas- change of entropy when ice changes into steam.
3. **Thermodynamic potentials and Maxwell's equations:** Thermodynamic potentials - Derivation of Maxwell's thermodynamic relations-Clausius-Clayperon's equation - Derivation for ratio of specific heats-Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect -expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.
4. **Low temperature Physics:** Introduction - Joule Kelvin effect - liquefaction of gas using porous plug experiment. Joule expansion - Distinction between adiabatic and Joule Thomson expansion -Expression for Joule Thomson cooling - Liquefaction of helium, Kapitza's method -Adiabatic demagnetization - Production of low temperatures - Principle of refrigeration, vapour compression type. Working of refrigerator and Air conditioning machines. Effects of Chloro and Fluro Carbons on Ozone layer; applications of substances at low-temperature.
5. **Quantum theory of radiation:**
Black body-Ferry's black body - distribution of energy in the spectrum of Black body -Wein's displacement law, Wein's law, Rayleigh-Jean's law - Quantum theory of radiation - Planck's law - deduction of Wein's law, Rayleigh-Jeans law, from Planck's law -Measurement of radiation - Types of pyrometers - Disappearing filament optical pyrometer - experimental determination - Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.
6. **Statistical Mechanics:**
Introduction to statistical mechanics, concept of ensembles, Phase space, Maxwell-Boltzmann's distribution law, Molecular energies in an ideal gas, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws, Black Body Radiation, Rayleigh-Jean's formula, Planck's radiation law, Weins Displacement, Stefan's Boltzmann's law from Plancks formula. Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.
7. **The Matrix methods in paraxial optics:** Introduction, the matrix method, effect of translation, effect of refraction, imaging by a spherical refracting surface. Imaging by a co-axial optical system. Unit planes. Nodal planes. A system of two thin lenses.
8. **Aberrations:** Introduction - Monochromatic aberrations, spherical aberration,

methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration-the achromatic doublet-Removal of chromatic aberration of a separated doublet.

9. **Interference:** Principle of superposition - coherence - temporal coherence and spatial coherence -conditions for Interference of light Interference by division of wave front: Fresnel's biprism - determination of wave length of light. Determination of thickness of a transparent material using Biprism -change of phase on reflection - Lloyd's mirror experiment.Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) - Colours of thin films - Non reflecting films - interference by a plane parallel film illuminated by a point source - Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) - Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) - Determination of wave length of monochromatic light - Michelson Interferometer - types of fringes - Determination of wavelength of monochromatic light, Difference in wavelength of sodium λ^2 lines and thickness of a thin transparent plate.
- 10.**Diffraction:** Introduction - Distinction between Fresnel and Fraunhofer diffraction Fraunhofer diffraction:- Diffraction due to single slit and circular aperture - Limit of resolution - Fraunhofer diffraction due to double slit - Fraunhofer diffraction pattern with N slits (diffraction grating) Resolving Power of grating - Determination of wave length of light in normal and oblique incidence methods using diffraction grating.Fresnel diffraction:- Fresnel's half period zones - area of the half period zones -zone plate - Comparison of zone plate with convex lens - Phase reversal zone plate - diffraction at a straight edge - difference between interference and diffraction.
- 11.**Polarization :** Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light - Brewsters law - Malus law – Nicol prism polarizer and analyzer - Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) - Quarter wave plate, Half wave plate -Babinet's compensator - Optical activity, analysis of light by Laurent's half shade polarimeter.
- 12.**Laser, Fiber Optics and Holography :** Lasers: Introduction - Spontaneous emission - Stimulated emission - Population inversion . Laser principle - Einstein coefficients - Types of Lasers - He-Ne laser -Ruby laser - Applications of lasers.Fiber Optics : Introduction - Optical fibers - Types of optical fibers - Step and graded index fibers - Rays and modes in an optical fiber - Fiber material - Principles of fiber communication (qualitative treatment only) and advantages of fiber communication. Holography: Basic Principle of Holography - Gabor hologram and its limitations, Holography applications.

Mechanics and Waves and Oscillations

1. **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.
2. **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, Rutherford scattering

3. **Mechanics of rigid bodies:** Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Eulers equation, precession of a top, Gyroscope, precession of the equinoxes
4. **Mechanics of continuous media:** Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of ν , n , k . Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions, simple supported beam carrying a concentrated load at mid span, cantilever with an end load
5. **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.
6. **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.
7. **Fundamentals of vibrations:** 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
8. **Damped and forced oscillations:** 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
9. **Complex vibrations:** Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw-tooth wave
10. **Vibrations of bars:** Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point 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.
11. **Vibrating Strings:** Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at both ends, overtones, energy transport, transverse impedance
12. **Ultrasonics:** Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Velocity of ultrasonics in liquids by Sear's method. Applications of ultrasonic waves.

103 - MATHEMATICAL SCIENCES

LINEAR ALGEBRA AND VECTOR CALCULUS

Marks : 80

Linear Algebra: Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, linear combination of vectors. Linear span, linear sum of two subspaces, Linear independence and dependence of vectors, Basis of vectorspace, Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace. Linear transformations, linear operators, Range and null space of linear transformation, Rank and nullity of linear transformations, Linear transformations as vectors, Product of linear transformations, Invertible linear transformation.

The adjoint or transpose of a linear transformation, Sylvester's law of nullity, characteristic values and characteristic vectors, Cayley- Hamilton theorem, Diagonalizable operators. Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, complete orthonormal set, Gram-Schmidt orthogonalisation process.

Multiple integrals and Vector Calculus: Multiple integrals : Introduction, the concept of a plane, Curve, line integral- Sufficient condition for the existence of the integral. The area of a subset of, Calculation of double integrals, Jordan curve , Area, Change of the order of integration, Double integral as a limit, Change of variable in a double integration.

Vector differentiation. Ordinary derivatives of vectors, Space curves, Continuity, Differentiability, Gradient, Divergence, Curl operators, Formulae involving these operators. Vector integration, Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Abstract Algebra & Real Analysis GROUPS: Binary operations- Definitions and properties, Groups—Definition and elementary properties, Finite groups and group composition tables, Subgroups and cyclic subgroups. Permutations-Functions and permutations, groups of permutations, cycles and cyclic notation, even and odd permutations, The alternating groups. Cyclic groups-Elementary properties, The classification of cyclic groups, sub groups of finite cyclic groups. Isomorphism - Definition and elementary properties, Cayley's theorem, Groups of cosets, Applications, Normal subgroups-Factor groups , Criteria for the existence of a coset group, Inner automorphisms and normal subgroups, factor groups and simple groups, Homomorphism-Definition and elementary properties, The fundamental theorem of homomorphisms, applications.

RINGS: Definition and basic properties, Fields, Integral domains, divisors of zero and Cancellation laws, Integral domains, The characteristic of a ring, some non – commutative rings, Examples, Matrices over a field, The real quaternions, Homomorphism of Rings - Definition and elementary properties, Maximal and Prime ideals, Prime fields.

REAL NUMBERS: The Completeness Properties of \mathbb{R} , Applications of the Supremum Property. Sequences and Series - Sequences and their limits, limit theorems, Monotonic Sequences, Sub-sequences and the Bolzano-Weirstrass theorem, The Cauchy's Criterion, Properly divergent sequences, Introduction to series, Absolute convergence, test for absolute convergence, test for non-absolute convergence. Continuous Functions-continuous

functions, combinations of continuous functions, continuous functions on intervals, Uniform continuity.

DIFFERENTIATION AND INTEGRATION: The derivative, The mean value theorems, L'Hospital Rule, Taylor's Theorem. Riemann integration - Riemann integral, Riemann integrable functions, Fundamental theorem.

DIFFERENTIAL EQUATIONS & SOLID GEOMETRY

Differential equations of first order and first degree: Linear differential equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables; Simultaneous differential equations; Orthogonal trajectories.

Differential equations of the first order but not of the first degree: Equations solvable for p ; Equations solvable for y ; Equations solvable for x ; Equations that do not contain x (or y); Equations of the first degree in x and y - Clairaut's equation.

Higher order linear differential equations: Solution of homogeneous linear differential equations of order n with constant coefficients. Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. Method of undetermined coefficients; Method of variation of parameters; Linear differential equations with non-constant coefficients; The Cauchy-Euler equation

System of linear differential equations: Solution of a system of linear equations with constant coefficients; An equivalent triangular system. Degenerate Case: $p_1(D) p_4(D) - p_2(D) p_3(D) = 0$.

SOLID GEOMETRY

The Plane: Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

The Line: Equations of a line, Angle between a line and a plane, The condition that a given line may lie in a given plane, The condition that two given lines are coplanar, Number of arbitrary constants in the equations of a straight line. Sets of conditions which determine a line, The shortest distance between two lines. The length and equations of the line of shortest distance between two straight lines, Length of the perpendicular from a given point to a given line, Intersection of three planes, Triangular Prism.

The Sphere: Definition and equation of the sphere, Equation of the sphere through four given points, Plane sections of a sphere. Intersection of two spheres; Equation of a circle. Sphere through a given circle; Intersection of a sphere and a line. Power of a point; Tangent plane. Plane of contact. Polar plane, Pole of a plane, Conjugate points, Conjugate planes; Angle of intersection of two spheres. Conditions for two spheres to be orthogonal; Radical plane. Coaxial system of spheres; Simplified form of the equation of two spheres.

Cones, Cylinders and conicoids: Definitions of a cone, vertex, guiding curve, generators. Equation of the cone with a given vertex and guiding curve. Enveloping cone of a sphere. Equations of cones with vertex at origin are homogenous. Condition that the general equation

of the second degree should represent a cone. Condition that a cone may have three mutually perpendicular generators Intersection of a line and a quadric cone. Tangent lines and tangent plane at a point. Condition that a plane may touch a cone. Reciprocal cones. Intersection of two cones with a common vertex. Right circular cone. Equation of the right circular cone with a given vertex, axis and semi-vertical angle. Definition of a cylinder. Equation to the cylinder whose generators intersect a given conic and are parallel to a given line, Enveloping cylinder of a sphere. The right circular cylinder. Equation of the right circular cylinder with a given axis and radius.

The general equation of the second degree and the various surfaces represented by it; Shapes of some surfaces. Nature of Ellipsoid. Nature of Hyperboloid of one sheet.

Statistics:

Marks : 20

Descriptive Statistics, primary and secondary data. Importance of moments, central and non-central moments, and their interrelationships, Sheppard's corrections for moments for moments for grouped data. Conditional, probability and independence of events. Boole's inequality and Bayes' theorem. Functions of random variables, Probability mass function and probability density function. Distribution function and its properties. Transformation of one-dimensional random variable, bi-variate random variable, bi-variate distribution. Joint marginal and conditional distributions. Mathematical expectation of a function of a random variable, Moment generating function, cumulative generating function, probability generating function and characteristic function and Chebyshe's and Cauchy-Schwartz's inequalities and their applications. Weak law of large numbers and central limit theorem. Uniform, Bernoulli, Binomial, Poisson, Negative binomial, Geometric and Hyper-geometric distributions. Rectangular and Normal distributions. Exponential, Gamma, Beta of two kinds and Cauchy distributions. Principal of least squares, simple linear regression and correlation verses regression, properties of regression coefficients. Population, parameter, random sample, statistics, sampling distribution and standard error. Sampling distribution properties of X^2 , t and F distributions. Bias and mean square error of an estimate. Criteria of good estimator-consistency, unbiasedness, efficiency and sufficiency, Neyman's Factorization theorem, Maximum likelihood (ML), interval estimation, confidence intervals. Tests of significance based on X^2 , t and F. Non-parametric tests. Types of sampling : i) SRSWE and SRSWOR (ii) Stratified random sampling with proportional and Neyman allocation. (iii) Systematic sampling. ANOVA, Gauss-Mark off linear model, Cochran's theorem, Analysis of Completely Randomized Design (C.R.D), Randomized Block Design (R.B.D), Latin Square Design (C.R.D).

04 CHEMICAL SCIENCES

Total

Marks: 100

INORGANIC CHEMISTRY

1. **s-block elements:** General characteristics of groups I & II elements, diagonal relationship between Li & Mg, Be & Al.
2. **p-block elements:** General characteristics of elements of groups 13, 14, 15, 16 and 17
 Group – 13: Synthesis and structure of diborane and higher boranes (B_4H_{10} and B_5H_9), boron-nitrogen compounds ($B_3N_3H_6$ and BN)
 Group – 14: Preparation and applications of silanes and silicones, graphitic compounds.
 Group – 15: Preparation and reactions of hydrazine, hydroxylamine, phosphazenes.

Group – 16: Classifications of oxides based on (i) Chemical behaviour and (ii) Oxygen content. Group – 17: Inter halogen compounds and pseudo halogens

- 3. Organometallic Chemistry :** Definition and classification of organometallic compounds, nomenclature, preparation, properties and applications of alkyls of 1, 2 and 13 group elements.
- 4. Chemistry of d-block elements:** Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states and e.m.f. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu triads in respect of electronic configuration and reactivity of different oxidation states.
- 5. Chemistry of f-block elements:** Chemistry of lanthanides – electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties, spectral properties and separation of lanthanides by ion exchange and solvent extraction methods. Chemistry of actinides – electronic configuration, oxidation states, actinide contraction, position of actinides in the periodic table, comparison with lanthanides in terms of magnetic properties, spectral properties and complex formation.
- 6. Theories of bonding in metals:** Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.
- 7. Metal carbonyls and related compounds** – EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni. Metal nitrosyls and metallocenes (only ferrocene).
- 8. Coordination Chemistry:** IUPAC nomenclature, bonding theories – review of Werner's theory and Sidgwick's concept of coordination, Valence bond theory, geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal field theory, splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes – low spin and high spin complexes – factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds – structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.
- 9. Spectral and Magnetic Properties of Metal Complexes:** Electronic absorption spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion. Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility – Gouy method.
- 10. Reactivity of metal complexes:** Labile and inert complexes, ligand substitution reactions – $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$, substitution reactions of square planar complexes – Trans effect and applications of trans effect.
- 11. Stability of Metal Complexes:** Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.
- 12. Hard and soft acids bases (HSAB):** Classification, Pearson's concept of hardness and softness, application of HSAB principles – Stability of compounds / complexes, predicting the feasibility of a reaction.
- 13. Bioinorganic Chemistry:** Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl^-). Metalloporphyrins – hemoglobin, structure

and function, Chlorophyll, structure and role in photosynthesis.

ORGANIC CHEMISTRY

1. Structural theory in Organic Chemistry: Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O , NH_3 & AlCl_3). Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity – inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes, carbanions, carbenes and nitrenes. Types of Organic reactions: Addition – electrophilic, nucleophilic and free radical. Substitution – electrophilic, nucleophilic and free radical. Elimination- Examples (mechanism not required).

2. Acyclic Hydrocarbons

Alkanes-IUPAC Nomenclature of Hydrocarbons. Methods of preparation: Hydrogenation of alkynes and alkenes, Wurtz reaction, Kolbe's electrolysis, Corey- House reaction. Chemical reactivity – inert nature, free radical substitution mechanism. Halogenation example- reactivity, selectivity and orientation.

Alkenes-Preparation of alkenes (a) by dehydration of alcohols (b) by dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides (brief mechanism), Saytzev's rule. Properties: Addition of hydrogen – heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX , Markonikov's rule, addition of H_2O , HOX , H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti – Markonikov's addition). Oxidation – hydroxylation by KMnO_4 , OsO_4 , peracids (via epoxidation) hydroboration, Dienes – Types of dienes, reactions of conjugated dienes – 1,2 and 1,4 addition of HBr to 1,3 – butadiene and Diel's – Alder reaction.

Alkynes–Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions Physical properties. Chemical reactivity – electrophilic addition of X_2 , HX , H_2O (Tautomerism), Oxidation with KMnO_4 , OsO_4 , reduction and Polymerisation reaction of acetylene.

3. Alicyclic hydrocarbons (Cycloalkanes) : Nomenclature, Preparation by Freund's methods, heating dicarboxylic metal salts. Properties – reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes – Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane.

4. Benzene and its reactivity : 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 – aromaticity (definition), Huckel's rule – application to Benzenoid (Benzene, Naphthalene) and Non – Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Reactions – General mechanism of electrophilic substitution, mechanism of nitration. Friedel Craft's alkylation and acylation. Orientation of aromatic substitution – Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of

- various groups like NO_2 and Phenolic). Orientation of (i). Amino, methoxy and methyl groups (ii). Carboxy, nitro, nitrile, carbonyl and Sulfonic acid groups. (iii). Halogens (Explanation by taking minimum of one example from each type).
5. **Polynuclear Hydrocarbons** - Structure of naphthalene and anthracene (Molecular Orbital diagram and resonance energy) Any two methods of preparation of naphthalene and reactivity. Reactivity towards electrophilic substitution. Nitration and sulfonation as examples.
 6. **Halogen compounds** : Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl halides. Chemical Reactivity, formation of RMgX Nucleophilic aliphatic substitution reaction-classification into $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$. Energy profile diagram of $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions. Stereochemistry of $\text{S}_{\text{N}}2$ (Walden Inversion) $\text{S}_{\text{N}}1$ (Racemisation). Explanation of both by taking the example of optically active alkyl halide – 2-bromobutane. Ease of hydrolysis – comparison of alkyl, benzyl, aryl, vinyl and aryl halides.
 7. **Hydroxy compounds** : Nomenclature and classification of hydroxy compounds. Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols. Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene. Physical properties- Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water. Chemical properties:
 - a. acidic nature of phenols.
 - b. formation of alkoxides/phenoxides and their reaction with RX .
 - c. replacement of OH by X using PCl_5 , PCl_3 , PBr_3 , SOCl_2 and with HX/ZnCl_2 .
 - d. esterification by acids (mechanism).
 - e. dehydration of alcohols.
 - f. oxidation of alcohols by CrO_3 , KMnO_4 .
 - g. special reaction of phenols: Bromination, Kolb-Schmidt reaction, Reimer-Tiemann reaction, Fries rearrangement, azocoupling. Identification of alcohols by oxidation with KMnO_4 , ceric ammonium nitrate, Lucas reagent and phenols by reaction with FeCl_3 . Polyhydroxy compounds: Pinacol-Pinacolone rearrangement.
 8. **Carbonyl compounds** : Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties: absence of hydrogen bonding, keto-enol tautomerism, reactivity of carbonyl group in aldehydes and ketones. Nucleophilic addition reaction with a) NaHSO_3 , b) HCN , c) RMgX , d) NH_2OH , e) PhNHNH_2 , f) 2,4-DNPH, g) Alcohols-formation of hemiacetal and acetal. Halogenation using PCl_5 with mechanism. Base catalysed reactions: a) Aldol, b) Cannizzaro reaction,
 1. and NaBH_4 . Analysis of aldehydes and ketones with a) 2,4-DNT test, b) Tollen's test, c) Fehling test, d) Schiff test, e) Haloform test (with equation). Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction.
 Oxidation of aldehydes- Baeyer-Villiger oxidation of ketones. Reduction:

Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with LiAlH_4

- 9. Carboxylic acids and derivatives :** Nomenclature, classification and structure of carboxylic acids. Methods of preparation by a) hydrolysis of nitriles, amides and esters. b) carbonation of Grignard reagents. Special methods of preparation of aromatic acids by a) oxidation of side chain. b) hydrolysis by benzotrichlorides. c) Kolbe reaction. Physical properties: Hydrogen bonding, dimeric association, acidity- strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids. Chemical properties: Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schmidt reaction, Arndt-Eistert synthesis, halogenation by Hell-Volhard- Zelinsky reaction. Derivatives of carboxylic acids: Reaction of acid chlorides, acid anhydrides, acid amides, esters (mechanism of the hydrolysis of esters by acids and bases).
- 10. Active methylene compounds :** Acetoacetic esters: preparation by Claisen condensation, keto-enol tautomerism. Acid hydrolysis and ketonic hydrolysis. Preparation of a) monocarboxylic acids. b) dicarboxylic acids. Reaction with urea Malonic ester: preparation from acetic acid. Synthetic applications: Preparation of a) monocarboxylic acids (propionic acid and n-butyric acid). b) dicarboxylic acids (succinic acid and adipic acid). c) α,β -unsaturated carboxylic acids (crotonic acid). Reaction with urea.
- 11. Exercises in interconversion**
- 12. Nitrogen compounds**
- 13. Nitro hydrocarbons:** Nomenclature and classification – nitro hydrocarbons – structure. Tautomerism of nitroalkanes leading to aci and keto form. Preparation of Nitroalkanes. Reactivity – halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Michael addition and reduction. Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1^0 , 2^0 , 3^0 Amines and Quarternary ammonium compounds. Preparative methods-1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism). 4. Reduction of Amides and 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 separation e) Reaction with Nitrous acid of 1^0 , 2^0 , 3^0 (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines–Bromination and Nitration. oxidation of aryl and 3^0 Amines. Diazotization Cyanides and isocyanides: Nomenclature (aliphatic and aromatic) structure. Preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iii) reduction iv) oxidation.

14. Heterocyclic Compounds

Introduction and definition: Simple 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring system – presence in important natural products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letter 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 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene from 1,4,- dicarbonyl compounds only, Paul-Knorr synthesis, structure of pyridine, Basicity – Aromaticity – Comparison with pyrrole – one method of preparation and properties – Reactivity towards Nucleophilic substitution reaction – chichibabin reaction.

15. **Carbohydrates:** Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n-hexane, cyanohydrin formation, reduction of Tollen's and Fehling's reagents and oxidation to gluconic and saccharic acid). Number of optically active isomers possible for the structure, configuration of glucose based on D-glyceraldehyde as primary standard (no proof for configuration is required). Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation). Cyclic structure of glucose. Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformational formula). Structure of fructose: Evidence of 2 – ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give 2-Carboxy-n-hexane). Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure and Haworth formula). Interconversion of Monosaccharides: Aldopentose to aldo hexose – eg: Arabinose to D- Glucose, D-Mannose (Kiliani - Fischer method). Epimers, Epimerisation – Lobry de Bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose eg: D-glucose to D-arabinose by Ruff degradation. Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (fructose) to aldohexose (Glucose)

16. **Amino acids and proteins:** Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids – definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: 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: Optical activity of naturally occurring amino acids: L-configuration, irrespective of sign rotation, Zwitterion 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.

17. **Mass Spectrometry:** Basic principles – Molecular ion / parent ion, fragment ions / daughter ions. Theory – formation of parent ions. Representation of mass spectrum. Identification of parent ion, (M+1), (M+2), base peaks (relative abundance 100%) Determination of molecular formula – Mass spectra of ethylbenzene, acetophenone, n-butyl amine and 1-propanal.

PHYSICAL CHEMISTRY

1. **Gaseous state:** Compression factors, deviation of real gases from ideal behavior. Van der Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The van der Waal's equation and the critical state. Relationship between critical constants and van der Waal's constants. The law of corresponding states and reduced equation of states. Joule Thomson effect. Liquefaction of gases: i) Linde's method and ii) Claude's method.
2. **Liquid state:** Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.
3. **Solid state:** Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Determination of crystal structure by Bragg's method and the powder method. Indexing of planes and structure of NaCl and KCl crystals. Defects in crystals. Stoichiometric and non-stoichiometric defects. Band theory of semiconductors. Extrinsic and intrinsic semiconductors, n- and p-type semiconductors and their applications in photo electrochemical cells.
4. **Solutions :** Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal solutions. Vapour pressure – composition and vapour pressure-temperature curves. Azeotropes-HCl-H₂O, ethanol-water systems and fractional distillation. Partially miscible liquids-phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.
5. **Colloids and surface chemistry:** Definition of colloids. Solids in liquids(sols), preparation, purification, properties-kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid. Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses. Adsorption: Physical adsorption, chemisorption. Freundlich, Langmuir adsorption isotherms. Applications of adsorption
6. **Phase rule:** Concept of phase, components, degree of freedom. Derivation of Gibbs phase rule. Phase equilibrium of one component – water system. Phase equilibrium of two-component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, desilverisation of lead. Solid solutions- compound with congruent melting point- (Mg-Zn) system, compound with incongruent melting point – NaCl- water system. Freezing mixtures.

7. **Dilute solutions:** Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties. Van't Hoff factor, degree of dissociation and association.
8. **Electrochemistry:** Specific conductance, equivalent conductance, measurement of equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorf's method. Application of conductivity measurements-determination of dissociation constant (K_a) of an acid, determination of solubility product of sparingly soluble salt, conductometric titrations. Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reactions, Nernst equation, single electrode potential, standard Hydrogen electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance. Reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Computation of cell EMF. Applications of EMF measurements, Calculation of thermodynamic quantities of cell reactions (ΔG , ΔH and K). Determination of pH using quinhydrone electrode, Solubility product of AgCl. Potentiometric titrations.
9. **Chemical kinetics:** Rate of reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Experimental methods to determine the rate of reaction. Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Kinetics of complex reactions (first order only): opposing reactions, parallel reactions, consecutive reactions and chain reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Theories of reaction rates- collision theory-derivation of rate constant for bimolecular reaction. The transition state theory (elementary treatment).
10. **Photochemistry:** Difference between thermal and photochemical processes. Laws of photochemistry-Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Ferrioxalate actinometry. Photochemical hydrogen-chlorine, hydrogen-bromine reaction. Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing). Photosensitized reactions- energy transfer processes (simple example)
11. **Thermodynamics:** The first law of thermodynamics-statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule's law-Joule-Thomson coefficient. Calculation of w , q , dU and dH for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation-Kirchoff's equation. Second law of thermodynamics. Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as

a state function, entropy changes in cyclic, reversible, and irreversible processes and reversible phase change. Calculation of entropy changes with changes in V & T and P&T. Entropy of mixing inert perfect gases. Entropy changes in spontaneous and equilibrium processes. The Gibbs (G) and Helmholtz (A) energies. A & G as criteria for thermodynamic equilibrium and spontaneity- advantage over entropy change. Gibbs equations and the Maxwell relations. Variation of G with P, V and T.

Chemistry and Industry

Physico Chemical methods of analysis

1. Separation techniques

1. Solvent extraction: Principle and process, Batch extraction, continuous extraction and counter current extraction. Application – Determination of Iron (III)
2. Chromatography: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, R_f values, factors effecting R_f values.
 - a. Paper Chromatography: Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram – ascending, descending and radial. Two dimensional chromatography, applications.
 - b. Thin layer Chromatography (TLC): Advantages. Principles, factors effecting R_f values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.
 - c. Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications
 - d. High Performance Liquid Chromatography (HPLC): Principles and Applications.
 - e. Gas Liquid Chromatography (GLC): Principles and Applications
2. **Spectrophotometry:** General features of absorption – spectroscopy, Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law for quantitative analysis of
 1. Chromium in K₂Cr₂O₇
 2. Manganese in manganous sulphate Iron (III) with thiocyanate.

3. Molecular spectroscopy

- (i) **Electronic spectroscopy:** Interaction of electromagnetic radiation with molecules and types of molecular spectra. Potential energy curves for bonding and antibonding molecular orbitals. Energy levels of molecules (σ, δ, n) . Selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore.
- (ii) **Infra red spectroscopy:** Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant. Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules and energy levels. Modes of vibrations in polyatomic molecules. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum.
- (iii) **Raman spectroscopy:** Concept of polarizability, selection rules, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.
- (iv) **Proton magnetic resonance spectroscopy (¹H-NMR)** Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals.

Chemical shift, NMR splitting of signals – spin-spin coupling, coupling constants. Applications of NMR with suitable examples – ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

- (v) **Spectral interpretation:** Interpretation of IR, UV-Visible, ¹H-NMR and mass spectral data of the following compounds 1. Phenyl acetylene 2. Acetophenone 3. Cinnamic Acid 4. para-nitro aniline.

Drugs, formulations, pesticides and green chemistry

1. Drugs

1. Introduction: Drug, disease (definition), Historical evolution, Sources – Plant, Animal synthetic, Biotechnology and human gene therapy
2. Terminology: Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors – brief treatment) Metabolites and Anti metabolites.
3. Nomenclature: Chemical name, Generic name and trade names with examples
4. Classification: Classification based on structures and therapeutic activity with one example each.
5. Synthesis: Synthesis and therapeutic activity of the following drugs, L-Dopa, Chloroquin, Omeprazole, Albuterol and ciprofloxacin.
6. Drug Development: Pencillin, Separation and isolation, structures of different pencillins
7. HIV-AIDS: Immunity – CD-4 cells, CD-8 cells Retrovirus, replication in human body. Investigation available, prevention of AIDS. Drugs available – examples with structures: PIS: Indinavir (Crixivan), Nelfinavir (Viracept), NNRTIS: Efavirenz (Susrtiva), Nevirapine (Viramune) NRTIs: Abacavir (Ziagen), Lamivudine (EpiVir, 3TC) Zidovudine (Retravir, AZT, ZDV)
8. Monographs of drugs: Eg Paracetamol, Sulpha methoxazole (Tablets)

2. Formulations

1. Need of conversion of drugs into medicine. Additives and their role (brief account only)
2. Different types of formulations

3. Pesticides

1. Introduction to pesticides – types – Insecticides, Fungicides, Herbicides, Weedicides, Rodenticides plant growth regulators, Pheromones and Hormones. Brief discussion with examples, Structure and uses.
2. Synthesis and present status of the following. DDT, BHC, Malathion, Parathion, Endrin, Baygon, 2,4-D and Endo-sulphon

4. Green Chemistry

Introduction: Definition of green Chemistry, need of green chemistry, basic principles of green chemistry

Green synthesis: Evaluation of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic), Pericyclic reactions (no by-product).

Selection of solvent:

- i) Aqueous phase reactions ii) Reactions in ionic liquids iii) Solid supported synthesis iv) Solvent free reactions (solid phase reactions)
- ii) Green catalysts: i) Phase transfer catalysts (PTC) ii) Biocatalysts

Microwave and Ultrasound assisted green synthesis:

1. Aldol condensation

2. Cannizzaro reaction
3. Diels-Alder reactions
4. Strecker synthesis
5. Willaimson synthesis
6. Dieckmann condensation

Macromolecules, materials Science and catalysis

1. **Macromolecules:** Classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization – tacticity. Molecular weight of polymers-number average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry, Osmometry and light scattering methods. Kinetics of free radical polymerization, derivation of rate law. Preparation and industrial application of polyethylene, PVC, Teflon, polyacrylonitrile, terelene and Nylon66. Introduction to biodegradability.
2. **Materials science:** Superconductivity, characteristics of superconductors, Meissner effect, types of superconductors and applications. Nanomaterials-synthetic techniques, bottom-up-sol-gel method, top-down- electro deposition method. Properties and applications of nano-materials. Composites-definition, general characteristics, particle reinforce and fiber reinforce composites and their applications.
3. **Catalysis:** Homogeneous and heterogeneous catalysis, comparison with examples. Kinetics of specific acid catalyzed reactions, inversion of cane sugar. Kinetics of specific base catalyzed reactions, base catalyzed conversion of acetone to diacetone alcohol. Acid and base catalyzed reactions- hydrolysis of esters, mutarotation of glucose. Catalytic activity at surfaces. Mechanisms of heterogeneous catalysis. Langmuir- Hinshelwood mechanism. Enzyme catalysis: Classification, characteristics of enzyme catalysis. Kinetics of enzyme catalyzed reactions-Michaelis Menton law, significance of Michaelis constant (K_m) and maximum velocity (V_{max}). Factors affecting enzyme catalysis- effect of temperature, pH, concentration and inhibitor. Catalytic efficiency. Mechanism of oxidation of ethanol by alcohol dehydrogenase.

GENERAL CHEMISTRY

1. **Atomic Structure and elementary quantum mechanics:** Blackbody radiation, Planck's radiation law, photoelectric effect, Compton effect, de Broglie's hypothesis, Heisenberg's uncertainty principle. Postulates of quantum mechanics. Schrodinger wave equation and a particle in a box, energy levels, wave functions and probability densities. Schrodinger wave equation for H-atom. Separation of variables, Radial and angular functions, hydrogen like wave functions, quantum numbers and their importance.
2. **Chemical Bonding:** Valence bond theory, hybridization, VB theory as applied to ClF_3 , BrF_5 , $Ni(CO)_4$, XeF_2 . Dipole moment – orientation of dipoles in an electric field, dipole moment, induced dipole moment, dipole moment and structure of molecules. Molecular orbital theory – LCAO method, construction of M.O. diagrams for homo- nuclear and hetero-nuclear diatomic molecules (N_2 , O_2 , HCl , CO and NO). Comparison of VB and MO theories.
3. **Stereochemistry of carbon compounds:** Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae. Stereoisomerism, Stereoisomers: enantiomers,

diastereomers- definition and examples. Conformational and configurational isomerism- definition. Conformational isomerism of ethane and n- butane. Enantiomers: Optical activity- wave nature of light, plane polarised light, interaction with molecules, optical rotation and specific rotation. Chiral molecules- definition and criteria- absence of plane, center, and S_n axis of symmetry- asymmetric and disymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and disymmetric molecules (trans -1,2-dichloro cyclopropane). Chiral centers: definition- molecules with similar chiral carbon (Tartaric acid), definition of mesomers- molecules with dissimilar chiral carbons (2,3-dibromopentane). Number of enantiomers and mesomers- calculation. D,L and R,S configuration for asymmetric and disymmetric molecules. Cahn-Ingold-Prelog rules. Racemic mixture- racemisation and resolution techniques. Diastereomers: definition- geometrical isomerism with reference to alkenes- cis, trans and E, Z- configuration.

4. **General Principles of Inorganic qualitative analysis:** Solubility product, common ion effect, characteristic reactions of anions, elimination of interfering anions, separation of cations into groups, group reagents, testing of cations.
5. **Molecular symmetry:** Concept of symmetry in chemistry- symmetry operations, symmetry elements. Rotational axis of symmetry and types of rotational axes. Planes of symmetry and types of planes. Improper rotational axis of symmetry. Inversion centre. Identity element. The symmetry operations of a molecule form a group. Flow chart for the identification of molecular point group.
6. **Theory of quantitative analysis:**
 - a) Principles of volumetric analysis. Theories of acid-base, redox, complexometric, iodometric and precipitation titrations, choice of indicators for these titrations.
 - b) Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and washing of precipitate, drying and ignition, precipitation from homogenous solutions, requirements of gravimetric analysis.
7. **Evaluation of analytical data:** Theory of errors, idea of significant figures and its importance, accuracy – methods of expressing accuracy, error analysis and minimization of errors, precision – methods of expressing precision, standard deviation and confidence limit.
8. **Introductory treatment to:**
 - a) Pericyclic Reactions Concerted reactions, Molecular orbitals, Symmetry properties HOMO, LUMO, Thermal and photochemical pericyclic reactions. Types of pericyclic reactions – electrocyclic, cycloaddition and sigmatropic reactions – one example each.
 - b) Synthetic strategies Terminology – Disconnection (dix), Symbol, synthon, synthetic equivalent (SE), Functional group interconversion (FGI), Linear, Convergent and Combinatorial syntheses, Target molecule (TM). Retrosynthesis of the following molecules
 - 1) acetophenone 2) cyclohexene 3) phenylethylbromide
 - c) Asymmetric (Chiral) synthesis Definitions-Asymmetric synthesis, enantiomeric excess, diastereomeric excess. stereospecific reaction, definition, example, dehalogenation of 1,2-dibromides by I^- . stereoselective reaction, definition, example, acid catalysed dehydration of 1-phenylpropanol

105 – HUMANITIES & SOCIAL SCIENCES

Total Marks: 100

Reasoning : Analogy Test – Alphabet Series – Test of Direction Sense – Coding – Decoding test – Number series – Puzzle – Problem on Age Calculation – Blood Relations – Calendar – Decision Making – Number Series – Matrix – Mathematical Reasoning – Statement and Assumption – Statement and Arguments – Dice – Clock – Inserting the Missing Character – Clerical Aptitude – Word formation – Venn Diagram.

Numerical Ability : General aptitude with emphasis on logical reasoning, graphical analysis, analytical ability, quantitative comparisons, series formation, puzzles, etc. Time and distance - Time and work General arithmetic aptitude - Ratios, Percentage Increase/Decrease - Numerical Logic - Arithmetic Test - Numerical Reasoning - Data Interpretation - Numerical Estimation.

General English : Active/Passive Voice; Parts of Speech; Time, Tense and Aspect; Phrasal Verbs; Auxiliary verbs; Use of Shall, will, For, Since; Idioms and Phrases; Common Errors; Preposition; Synonyms and Antonyms; Precis Writing and Comprehension

Current Affairs : Current events of national and international importance. - History of India and Indian National Movement. - Indian and World Geography - Physical, Social, Economic Geography of India and the World. - Indian Polity and Governance - Constitution, Political System, Panchayati Raj, Public Policy. - Economic and Social Development Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, etc. General issues on Environmental Ecology, Bio-diversity and Climate Change - that do not require subject specialization. General Science.

106. TELUGU

Total Marks 100

Section - A

ప్రాచీన కవిత్వం

1. నన్నయ - గంగాశంతనుల కథ
ఆంధ్ర మహాభారతం - ఆదిపర్వం - నాల్గవ అశ్వాసం (120-165) "సరవరుడగు శంతనునకు" నుండి "దివ్యభూషణాలంకృత" వరకు
2. తిక్కన - మూషిక మార్జాల వృత్తాంతం
ఆంధ్రమహాభారతం - శాంతిపర్వం - మూడవ అశ్వాసం (202-242) అడవిలో నొకమట్టి ----- నుండి సౌఖ్యము బొందెన్.
3. అల్లసాని పెద్దన - హంసీచక్రవాక సంవాదం
మనుచరిత్రము - ఆరవ అశ్వాసం (62 - 88) "గంగాతరంగిణి" నుండి "జంభారి భిదుర సంరంభము" వరకు
4. తరిగొండ వెంగమాంబ - ఎఱుకత
శ్రీ వేంకటాచల మహాత్మ్యం - ఐదవ అశ్వాసం (4-15) "వకుళను వినాహ ప్రయత్నంబు" నుండి "అనియిట్లు" వరకు
5. సోతన - వామనావతారము
ఆంధ్ర మహాభాగవతము - ఎనిమిదవ స్కంధం (585-621) "కులమున్ రాజ్యము" నుండి "రవిబింబంబుపమింప" వరకు
6. కోణవిగోసరాజు - శాలివాహన విజయం
సింహాసన ద్వాత్రింశిక - ఒకటవ అశ్వాసం (115 - 165) "సజ్జిత దానధర్మ" నుండి "ఇట్లు విక్రమార్కుడీల్లిన వరకు
7. రఘునాథనాయకుడు - గ్రీష్మర్షువు - బోయపల్లి వాల్మీకి చరిత్ర - రెండవ అశ్వాసం (70 - 100) "కోకిల కంఠ" నుండి "అనిన నవకౌము" వరకు

Section - B

ఆధునిక కవిత్వం

8. గరిమెళ్ళ సత్యనారాయణ - మాకొద్దీ తెల్లదొరతనము
9. శ్రీ శ్రీ - మహాప్రస్థానం
10. జూమన - ముసాఫరులు
11. పుట్టపర్తి నారయణాచార్యులు - మేఘదూతలు
12. కుసుమ ధర్మన్న - అలకింపుమయ్య హరిజన శతకము (1-20) "శ్రీహరినుత నీడు" నుండి "నీకులంబువారు" వరకు.
13. పింగళి, కాటూరి - సౌందర నందము నుండి ధర్మపంచాదము (" అల్లవనిల్లి" నుండి "అసదృశమ్మగు" వరకు)
14. కాళోజీనారాయణరావు - బతకమ్మా! బ్రతుకు (నాగొడవలోంచి) "గుమ్మడిపూలు" నుండి "అమ్మమమరువని" వరకు.
15. డా॥ అందెశ్రీ - మనిషి
16. బెళ్ళూరి శ్రీనివాసమూర్తి - రాయలసీమ - గంజి కేంద్రము ("తపోవనము" లోంచి) "వీ తపస్వి" నుండి "కనులేకానగరాని" వరకు
17. విమల - వంటిల్లు "ఎంత అద్భుతమైంది" నుండి "ఒంటరి వంటగదులు" వరకు

కథానికలు

18. పాలగుమ్మి పద్మరాజు - గాలివాన
19. కొలకలూరి ఇనాక్ - ఆకలి
20. కేతువిశ్వనాథ రెడ్డి - నమ్మకున్నవేల
21. పొట్లపల్లి రామారావు - జైలు

Section - C

వ్యాకరణం

22. సంధులు - సవర్ణదీర్ఘ, గుణ, యణాదేశ, వృద్ధి, త్రిక, గ.స.డ.దవాదేశ, రుగాగమ, టుగాగమ, ఆమ్రేడిత, ఆత్మసంధి మొదలైనవి.
 23. సమాసాలు - తత్పురుష కర్మధారయ, ధ్వంద్వ, ద్విగు, బహువ్రీహి మొదలైనవి.
 24. ఛందస్సు - ఉత్పలమాల, చంపకమాల, శార్దూలము, మత్తేభము, కందము, తేటగీతి, ఆటవెలది.
 25. అలంకారాలు - ఉపమ, రూపక, ఉత్పేక్ష, స్వభావోక్తి, అతిశయోక్తి, అర్థాంధరన్యాస, దృష్టాంతము.
 26. సామాన్యవ్యాసాలు - సమకాలీన సాంస్కృతిక, వైజ్ఞానిక, సామాజిక అంశాలు.
- డిగ్రీ రెండవ సంవత్సరం పాఠ్యగ్రంథాన్ని మారుతి పబ్లిషింగ్ హౌస్, హైదరాబాదు వారు ప్రచురించడానికి సిఫారసుచేస్తూ తీర్మానించి అనుమతి కోరడమైనది.

మాదిరి ప్రశ్నలు

1. గంగాశంతనుల కథ ఏ గ్రంథంలోనిది.
 - a) ఆంధ్ర మహాభారతం
 - b) మను చరిత్రము
 - c) వసుచరిత్రము
2. రాముడు + అతడు = రాముడతడు
 - a) గుణ సంధి
 - b) సవర్ణ దీర్ఘ సంధి
 - c) యడగమ సంధి
 - d) వీధికాదు

ANNEXURE - A

(Use this form as Original)

LOCAL CANDIDATE CERTIFICATE FORM – I

I certify that Mr. / Ms.
..... Son / Daughter / Wife of a candidate for
admission to the studying in the following
educational institutions during the four or more consecutive academic years ending with the
academic year in which he / she appeared in the above qualifying examination.

S. No	College Name educational Qualification	Place	Year
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- 1.
- 2.
- 3.
- 4.

and thus is a Local candidates in the Krishna University area within the meaning of
G.O.Ms. No.453 General Administration (SLF-B) dt. 3rd July, 1974.

SIGNATURE

Place :
Date :

Designation:
(with Office Seal)

FORM – II

Admissions for
Course.

1. It is hereby certified a) that S/o, D/o

- a) Candidate for admission to the course, appeared for the first time for the examination (belong the minimum qualifying examination for admission to the course mentioned above) in(Month) (Year)
- b) That he /she has not studied in any educational institution during the whole period or a part of the four consecutive academic years ending with the academic year in which he / she first appeared for the aforesaid examination.
- c) That in the four years immediately preceding the commencement of the aforesaid examination he / she resided in the following place / places falling within the Local area in respect of University, namely.

1.

2.

3.

4.

2. The above candidate is, therefore, a Local candidate in relation to the Local area specified in paragraph 3(1) / 3(2) / 3(8) of the Andhra Pradesh Educational Institutions (Regulation of Admission) order 1974.

Place :

Date :

Office Seal :

Officer of Revenue Department
(Not below the rank Mandal Revenue Officer)

ANNEXURE – B
FORM – III
(STUDY CERTIFICATE)

(Applicable only to candidates who have studied in Andhra Pradesh for at least seven consecutive years and to whom Form-I does not apply)

It is hereby certified (a) that S/o /
D/o..... a candidate for
admission to theCourse appeared, or, as
the case may be, first appeared for the to the course mentioned above) in
.....(Month) (Year) (b) that he / she
has studied in educational institutions in the State of Andhra Pradesh for a period of not less than seven
consecutive academic years ending with the qualifying examination mentioned in para (a) as indicated
below. -----

S. No	No. of Years	College or Educational Institution in which studied	Place	Academic Years
-------	-----------------	--	-------	----------------

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

(c) and that therefore he / she having studied for the maximum period or equal period, as the case may be, within the Krishna University area the meaning of the Andhra Pradesh Educational Institutions, (Regulations of Admission) Order 1974 as amended by the second Amendment Order (vide G.O.Ms.816 Gen. Admn. A.P.E.-B) date 22-11-86) is a Local candidate.

Place	:	Principal of the College / Institution
Date	:	(in which candidate last studied)

Designation:
(with Office Seal)

ANNEXURE - C
FORM – IV

(CERTIFICATE OF RESIDENCE)

Applicable only to candidates who resided in the State of Andhra Pradesh for seven consecutive years preceding the qualifying examination whether or not he / she studied in any educational institution in the state of Andhra Pradesh.

It is hereby certified (a) that
S/o / D/o.....
..... a candidate for admission to the Course appeared for the examination (being the relevant qualifying examination for admission to the course mentioned above) in (Month).....Year (b) that he / she has not studied in any educational institutions in Andhra Pradesh during the whole part of period of seven years ending with the qualifying examination, but resided within the state of Andhra Pradesh during the whole of the said period within the Krishna University area as detailed below.

S. No No. of College or Educational Institution in which Place Academic Years
Years studied

- 1.
2.
3.
4.
5.
6.
7.

(c) and that therefore he / she having resided for the longest period during the last part or the equal period, as the case may be, within the Acharya Nagarjuna University area he / she is a Local candidate of the Acharya Nagarjuna University area within the meaning of the Andhra Pradesh Educational Institutions, (Regulations of Admission) Order 1974 as amended by the second Amendment Order 1976 (vide G.O.Ms.No.816 Admn.(SPF-B) date 26-11- 75).

Place : Officer of Revenue Department
Date : (Not below the rank Mandal Revenue Officer)

Office Seal :

ANNEXURE-D

DECLARATION FORM

(To be given by the Applicant and the Parent)

I

.....
abide by the rules and regulations of admissions for the academic year 2019-20.

Signature of the Parent / Guardian
Applicant

Signature of the

Date: