

**Dr. B. R. Ambedkar University, Srikakulam  
Common Entrance Test-2019**

*for admission into P.G. Courses of Dr. B. R. Ambedkar University, Srikakulam  
and its affiliated colleges*

**DR.BRAUSKLMCET-2019**



**INFORMATION BROCHURE**



**Prof. G. Tulasi Rao**

**Director**

**Directorate of Admissions**

**Dr. B. R. Ambedkar University, Srikakulam**

**[www.braudoa.in](http://www.braudoa.in)**



## **Dr. BRAUSKLMCET - 2019**

Dr. B.R. Ambedkar University, Srikakulam invites online applications from eligible candidates for admission to various Academic Programmes in regular mode of M.A., M.Com, M.L.I.Sc, MJMC, M.Ed and M.Sc. Of the University Campus College and its affiliated colleges for the academic year 2019-20 through Dr. BRAUSKLMCET - 2019.

**Cost of Application: Rs 500/- (For SC and ST candidates: Rs 300/-)**

Commencement of Submission of Online Applications	<b>20-03-2019</b>
Last date for submission of online Applications	<b>25-04-2019</b>
Last date for submission of online Applications with a late fee of Rs. 500/-	<b>30-04-2019</b>
Last date for submission of online Applications with a late fee of Rs. 1000/-	<b>04-05-2019</b>
Downloading Hall-Tickets from website	<b>08-05-2019</b>
Commencement of Entrance Test (Tentative)	<b>13th,14th, 15th, 16th May, 2019</b>
Date of Publication of Results	<b>21-05-2019</b>

**Dr. B. R. AMBEDKAR UNIVERSITY, SRIKAKULAM**  
**COMMON ENTRANCE TEST – 2019**  
**(Dr.BRAUSKLMCET-2019)**

**ADMISSION INFORMATION BROCHURE**

**I. GENERAL INSTRUCTIONS:**

1. The Convener of Admission Dr. B. R. Ambedkar University, Srikakulam invites applications from eligible candidates for admission through Dr. B. R. Ambedkar University Common entrance Test (Dr. BRAUSKLMCET, 2019), into various Arts and Sciences Courses offered in Campus College of Dr. B. R. Ambedkar University (Dr.BRAU-SKLM), and Colleges affiliated to B.R.A.U. offering P.G. Courses for the academic year 2019-20.
2. Candidates who have already passed their qualifying degree examination or who have appeared/are appearing for the final examination in 2019 only are eligible for Dr. BRAUSKLMCET-2019. Candidates qualified in advanced supplementary examinations of 2019 are also eligible.
3. Candidates seeking admission into various courses of study for which tests are conducted should appear for Dr. BRAUSKLMCET-2019. Eligibility criteria for different courses and Tests to be conducted are given in Appendix-I.
4. Candidates from other recognized Universities are considered for admission into PG Arts and Sciences Courses only if they possess a three year Bachelor Degree of 10+2+3 pattern, subject to submission of residence certificate.
5. Bachelor Degrees of B.A./B.Sc/B.Com./B.A.Ltt. and B.L. from Universities other than AP Should be recognized by the respective Universities as equivalent thereto.
6. The requirement for admission into all Science Courses offered by these Universities is a minimum aggregate of 50% marks in Group Subjects (Part-II) of the qualifying examination unless or otherwise specified. For SC and ST candidates minimum aggregate of 45% marks in group subjects (part-II of the qualifying examination unless or otherwise specified).
7. The requirement for Arts and Commerce courses is generally a pass in the appropriate qualifying degree. The requirement for M.Ed. course is a pass in Bachelors Degree with a minimum aggregate of 50% marks in B.Ed. (45% for SC & ST Candidates).
8. ALLOWING A CANDIDATE FOR Dr. BRAUSKLMCET-2019 DOES NOT GUARANTEE A RIGHT OF ADMISSION INTO THE COURSE OF STUDY. A candidate must satisfy the eligibility criteria as given in Appendix-I. Candidates

allowed to take the entrance test and subsequently getting seats by furnishing false information are liable for prosecution and cancellation of seats without notice. The decision of the admitting authority is final.

9. Candidates who have already completed one P.G. Course (professional or Non-Professional) will not be provided hostel accommodation and will not be considered for any type of scholarship what's ever, as per G.O.s in force and 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 it is 30 years for PG and other courses.**
10. Candidates who have already studies 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.
11. The concerned University reserves the right to fill or not to fill the seats earmarked for particular course on administrative reasons. All admission are purely provisional and the concerned 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. **A minimum of 10 candidates or 50% of sanction strength of seats for a course whichever is less should join in any course under Self Finance or Payment streams to run the course.**
12. The candidates seeking admission into the courses offered without entrance test should also apply online against the notification.
13. **MEDIUM OF INSTRUCTION IN ALL P.G.COURSES EXCEPT LANGUAGES OFFERED WILL BE IN ENGLISH. HENCE THE CANDIDATES SHALL WRITE THEIR SUBSEQUENT EXAMINATIONS AFTER ADMISSION IN ENGLISH ONLY.**
14. All disputes pertaining to Dr. BRAUSKLMCET-2019 shall fall within the court's Jurisdiction of, Srikakulam.

## **II. HOW TO APPLY:**

**SUBMISSION OF FILLED IN APPLICATIONS THROUGH ONLINE:** Applications should be submitted through Online Submission only.

For Online submission, visit the **website [www.braudoa.in](http://www.braudoa.in)**. A candidate has to pay Rs.500/- (Rs.300/- for SC/ST/PHC) (Plus Bank charges applicable for the mode of payment selected) as Registration and Application Processing (and late fee if applicable)

by opting any of the following modes of payment (a) Debit/Credit/Net Banking After filling the online Application form with the required details. Verify all the details carefully and press Submit button. Filled in application form will be generated that contains Application number along with filled details. Take a print out of filled in Online Application Form and use the Application number for future correspondence till the admission process is completed.

**The following information must be kept ready for filling the details of Online submission**

- a) Select the eligible courses
- b) Hall Ticket Number of Qualifying Examination
- c) Percentage of marks and year of passing of Qualifying Examination, if Passed
- d) Date of Birth as per SSC record
- e) Caste in case of SC/ST/BC candidates
- f) PH/NCC/NSS/SPORTS/CAP etc.?’
- g) Parental Income up to One lakh or up to Two Lakhs or more than Two lakhs (rupees)
- h) Study or Residence (from M.R.O.) or relevant certificate for proof of local status
- i) Test code and test centre code (APPENDIX- IV)

**General Instructions**

- 1) The University reserves the right to reject the application of a candidate at any stage, if a) the Application is incomplete, b) the candidate fails to satisfy the prescribed eligibility conditions, C) False or incorrect information is furnished.
- 2) Any change whatsoever, including that of caste/community status or category, shall not be permitted to be made in the filled in application once it is received by the University and no correspondence will be entertained in this regard. Upload of complaints will be allowed during 06-05-2019.
- 3) The Convener, Dr. BRAUSKLMCET-2019 is not responsible for non-submission of application within the notified date and time for any reason whatsoever.
- 4) The candidates should preserve the BRAUSKLMCET HALL TICKET to produce at the time of test and later at the time of admission into the course.
- 5) For NCC/NSS/Sports categories the certificates obtained in qualifying examination alone are considered.

- 6) The candidates need not apply again for admission into University Colleges and Colleges affiliated to Dr.BRAU.
- 7) INCOMPLETE APPLICATIONS WIL BE SUMMARILY REJECTED.

### **III. HALL-TICKETS:**

- 1) Candidates should download the Hall-Tickets from the University website **www.braudoa.in**. All candidates are advised to check the website frequently after applying for updates and other useful information.

### **IV. TEST CENTRES:**

1. **Dr. BRAUSKLMCET-2019 will be conducted at the following Test Centres :**

**SRIKAKULAM, PALASA, BOBBILI, VISAKHAPATNAM,  
VIZIANAGARAM, RAJAHMAHENDRAVARAM, VIJAYAWADA,  
TIRUPATHI**

**Test center codes are given in appendix - IV**

1. Candidate should mention the Centre code and name of his/her choice of Test Centre in Online Application Form. Candidates applying for more than one test are advised to opt for the same centre as there is likelihood of clash of dates and timings. Requests for change of Test Centre and Subject opted by the candidate in the Application Form will not be considered under any circumstances.
2. When the number of registered candidates for any test is below 200, the test will be conducted at Srikakulam centre only.
3. Dr B R Ambedkar University reserves the right to (a) allot a Centre other than the candidates choice, (ii) conduct or not to conduct any test and (ii) cancel Test/Tests, based on the number of candidates opted for the Test/Test Centre.
4. When the number of application is less than the number of seats for any test, the test will not be conducted and admission will be made based on the marks obtained in qualifying degree.

### **V. TEST PROCEDURE:**

- 1) The Syllabi for the entrance test can be had from the websites **www.braudoa.in** and given in Appendix II.
- 2) Candidates shall come to the Examination hall at least half an hour before the commencement of the Test

- 3) Candidates will not be allowed into the examination hall without Hall-ticket or after the commencement of the test. They will not be allowed to leave the examination hall before the stipulated time.
- 4) Calculators, Pagers, cell phones, books, papers, logarithm tables, or any other calculating aids are NOT ALLOWED into the Examination Hall.
- 5) Candidates should answer on the candidate specific (with candidates name, Hall Ticket Number and photo) OMR ANSWER SHEET only.
- 6) The Chief Superintendent of the test centre can take disciplinary action on candidates involved in indiscipline, malpractice, impersonation, Etc., and the answerer scripts of such candidates will not be verified.

#### **VI. RANK:**

- 1) All candidates appeared for the Entrance Test will be awarded Dr. BRAUSKLMCET, 2019 test-wise Ranks as per marks secured in the test appeared.
- 2) In case of the candidates securing the same mark in a test, the order of merit will be decided on the basis of date of birth of the candidate with priority to the older candidate.
- 3) Information regarding college-wise, course wise and reservation category-wise seat distribution and fee structure will be made available by the University after declaration of Dr. BRAUSKLMCET-2019 result on the web sites **[www.braudoa.in](http://www.braudoa.in)**.
- 4) At the time of certificate verification at helpline centres, candidates should produce the following original certificates in support of the qualification and reservation claimed in the application for verification.
  - (i) Dr. BRAUSKLMCET-2019 Rank Card & Hall Ticket
  - (ii) Degree/Provisional Pass Certificate
  - (iii) Consolidated Marks Statement of the Qualifying Examination
  - (iv) Transfer and Conduct Certificate from the institution where the candidate last studies. Candidates who have completed/studied already or discontinued and seeking admission to second PG or professional course should submit TC relating to first PG Course only Duplicate TC relating to UG/PG degree should be accompanied by proper evidence of loss of original TC, Police complaint with not tractable affidavit. Candidates submitting false TC are liable for cancellation of seat at any stage and are liable for prosecution

(Admission will not be given if TC of the institution where the candidate studied last is not submitted)

- (v) Migration Certificate (for other University Students)
  - (vi) Date of Birth Certificate (SSC/Matriculation or equivalent Certificate).
  - (vii) Study Certificates for the last seven years or Residence Certificate for preceding seven years of the qualifying examination
  - (viii) Intermediate Original Certificate
  - (ix) Integrated Community Certificate issued by the competent authority in case of SC/ST/EBC/Minority candidates.
  - (x) Valid latest Income certificate issued by M.R.O/Tahsildar if fee concession is claimed (the validity of income certificate is four years from the date of issue) or White Ration Card (g.O.M.S.No.186, dt.26-05-2015)
  - (xi) 4 recent passport size Photos.
  - (xii) Candidates opting for admission under NCC/Sports/CAP/PH/NSS quota shall produce relevant original certificate in addition to the above.
  - (xiii) Discharge Certificate and service certificate of the parent in case of children of armed personal.
  - (xiv) Physical fitness certificate from an Asst. Civil Surgeon
  - (xv) One set of Photostat copies of all the above certificate
- 5) After verification of the Certificates, at the helpline centre, the candidates will get all his/her Original Certificates back except TC, CC and Migration Certificate. The receipt of Original Certificates shall be given to the candidates.
- 6) The cases of pending revaluation will not be considered.
- 7) The concerned University reserves the right to deny entry into Dr. BRAUSKLMCET-2019. If the University finds the antecedents of the candidates are bad subsequent to the appearance of Dr. BRAUSKLMCET-2019, his/her rank can be cancelled even if admission is given.
- 8) All the admissions are purely provisional and the University reserves the right to cancel the admission at any stage.

## **VII. Guidelines for Admission:**

- a) The conversion of reserved/special category seats into other category will not be made in the first phase counseling
- b) The student has to select the course of study through web options

- c) Candidates who did not claim their reservation/Special category at the time of submission of their application will also be allowed under that particular category subject to production of original Certificate.
- d) Cancellation of seats: Cancellation of seats will be made with 90% refund of total fee prescribed before completion of first phase of counseling and 80% refund of the total fee prescribed before completion of second phase counseling and with no fee refund after second phase of counseling.

### **VIII. RESERVATION OF SEATS:**

Admission into various courses of study shall be made on the basis of BRAUSKLMCET-2019 Rank and eligibility criteria subject to the rule of reservation as detailed below.

#### **A. LOCAL CANDIDATES :**

In every course of study and category (explained in the following section) 85% of the available seats are reserved in favour of the Local Candidates from the districts of Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur and Prakasam belonging to Andhra University area.

1. A Candidate shall be regarded as a local candidate in relation to a local area (AU/OU/SVU) as follows.
  - 1.1.If he/she has studied in an educational institution or educational institutions in such local area for a period of not less than four consecutive academic years ending with the academic year in which he/she appeared or first appeared in the relevant qualifying examination as the case may be : OR
  - 1.2.Where, during the whole or any part of the four consecutive academic years in which he/she appeared or first appeared in the relevant qualifying examination, he/she has not studied in any educational institutions, if he/she resided in that local area for a period of not less than four years immediately preceding the date of commencement of the relevant qualifying examination in which he/she appeared, or first appeared as the case may be.
2. A candidate who is not regarded as local candidate under clause (1.1) above in relation to any local area shall be regarded as a local candidate of AU/OU/SVU.

2.1 If he/she has studied in the educational institutions in the state for a period of not less than seven consecutive academic years ending with the academic year in which he/she first appeared in the relevant qualifying examination as the case may be, be regarded as a local candidate in relation to (i) Such local area where he/she has studied for the maximum period out of the period of seven years, of (ii) Such the period of his/her study in two or more local areas is equal, such local area where he/she studied last in such equal periods.

2.2 If during the whole or any part of the seven consecutive academic years ending with the academic year in which he/she appeared or first appeared for the relevant qualifying examinations, he/she not studied in the educational institutions, in any local area, but has resided in the State during the whole of the said period of seven years, be regarded as a local Candidate in relation to (i) Such local area where he/she has resided for the maximum period out of the said period of seven years or (iii) Where the period of his/her residence in two or more local areas is equal, such local area where he/she has resided last in such periods.

3. The remaining 15% seats can be competed by the categories mentioned below :
- a) All candidates defined as “Locals” of Andhra University area and
  - b) The following categories of candidates are defined as “Non Locals” for the present purpose (i) All Candidates, who are locals for Osmania and Sri Venkateswara University areas (ii) Candidates who have resided in the State of Andhra Pradesh for a total period of ten years, excluding periods of study outside the State, or either of whose parents have resided in the State for a period of ten years excluding periods of employment outside the State (iii) Candidates whose spouses/children of those in the employment of the State or Central Government. Public Sector Corporations, Local Bodies Universities, Educational institutions recognized by the Government and similar State or quasi Government Institutions within the State. A Certificate to the effect from the Head of the Institution or Department should be enclosed (G.O.No.646, dated 10-07-1979).

## **IX OTHER CATEGORIES OF RESERVATION:**

The allocation of percentage of seats as detailed below is as per G.O.M.S.No.184, Education (EC-2) Department, dated 20-08-1993, and G.O.M.S.No.116 SWICV.-1), dated 10-12-1999 as amended up to date:

- a) Scheduled Castes (SC) 15% Scheduled Tribes (ST) 6%, Listed Backward Classes (BC:29%, A-7%, B-10%,C-1%, D-7% and E-4%).
- b) NCC: 1%, Sports: 0.5%; Children of Armed Forces Personnel (CAP) 2% of seats be filled by horizontal method of reservation. This reservations is applicable for local candidates only
- c) 33.33% of the seats are filled by following horizontal methods of reservation. In the absence of suitable PH candidates in the respective categories, these seats will be filled in with other candidates of the same category. This reservation applicable for local candidates only.
- d) 33.33% of the seats in each course shall be **reserved in favour of women** candidates in each category. This rule of reservation shall not be applicable if women candidates selected on merit in each category form 33.33% or more of the seats therein. In the absence of eligible women candidates in categories of SC,ST,BC Groups A,B,C,D,E,CAP, NCC PH and Sports, those seats will be filled in with men candidates of the same category ( (G.O.M.S.No.184, dt.20-8-1993).
- e) The number of seats reserved under various categories shall be calculated on the total seats available in the respective units given below as per the existing rules of the University: If there is any fraction in the calculation of seats under reservation for various categories, it should be rounded off to the nearest number without affecting the sanctioned strength.
- j) All Science courses offered by respective University Campus College are taken as one unit each.
  - ii) All Science courses offered by all colleges under the Government and Private managements affiliated to Dr BRAU, Srikakulam are taken as one unit each.
  - iii) All Arts courses offered by Campus College are taken as one unit each.
  - iv) All Arts Courses offered by all colleges under the Government and Private managements affiliated to Dr BRAU, Srikakulam are taken as one unit each.

1% supernumerary seats in each course are available in B.R.A.U Campus to candidates belonging to B.R.A.U. NSS candidates. The selection of the candidates for the NSS categories will be made under the following three categories i.e., A,B,C.

“A” Grade: The Volunteer should fulfill the Tasks and Targets of two years service along with Special Camp participation and represented the Nation in the International Event

in NSS activities OR recipient of Indira Gandhi National NSS Award OR participant in the Republic Day parade Camp in New Delhi.

“B” Grade: The volunteer should fulfill the Tasks and Targets of Two Years service along with special camp participation and participated in the National Integration Camp Pre-R.D. Camp, Inter – Collegiate Camp, Youth Leadership training Camp winners of the district, University youth Festivals, and recipients of District/university level NSS Best Service Awards.

“C” Grade: The Volunteer should fulfill the Tasks and Targets of two years service and participation in the Special Camping Programme.

- f) 5% supernumerary seats in each course are available in Campus College of the Universities to candidates belonging to other States. To consider a candidate under Other States category the candidate should have studies in any state other than A.P. and be a native of a place outside A.P.
- g) 15% supernumerary seats are available in Campus colleges of the participating Universities Colleges to **Foreign Students** in each course as per the D.D.No.F1-30/94(CPP-11) of UGC subject to their eligibility such candidates need not appear for the Entrance Test. Their applications will be considered under separate fee structure applicable to foreign students.

#### **PROCEDURE FOR ADMISSION TO RESERVED SEATS:**

- (i) SC, ST and EBC (A,B,C,D,E) seats will be filled as per the order of merit (Rank) in each category.
- (ii) In case of special reservation, University will constitute expert committees with competent authorities and they will fix the priority.
- (iii) Candidates seeking admission under Sports, PH, NCC CAP and NSS are directed to appear before admission committee along with all original certificates in support of their claim for verification. The admissions are based on the order of priority fixed by the panel of experts and subject to availability of seats in the particular course/college, as per rules mentioned in Admission Information Brochure BRAUSKLMCET-2019 **Only local candidates are eligible for admission under NCC, PH,CAP,NSS and Sports categories.**

#### **X. GENERAL REGULATIONS DURING STUDY OF THE COURSE:**

- a) As per the UGC guidelines all Candidates admitted into various courses of study are required to put in a minimum of 75% of class room attendance. Candidates not

securing a minimum of 75% attendance should repeat the course. The name of a student who continuously remains absent for a period of 10 days from the date of admission without valid reasons and intimation to the concerned Head of the Department shall be removed from the rolls.

- b) Candidates admitted into full time (day) courses should not undertake any assignment/employment or study of any other course simultaneously (except evening diploma course where he/she has to get no objection certificate) and any violation leads to cancellation of admission.
- c) Payment of residential scholarships in respect of eligible students of all reserved categories is conditional on their putting a minimum attendance of 75% in the college in each quarter. If the candidate puts in less than 75% of attendance for valid reasons he/she shall be paid scholarship in proportion to the attendance. Those who are absent themselves without valid reasons will not be paid any scholarship.
- d) Examinations shall be conducted at the end of each Semester. No supplementary examination will be conducted.
- e) **RAGGING** in any form by any student will make him/her liable for expulsion/punishment as per A.P. Ragging Act 26 of 1997 and subsequent Supreme Court verdict.
- f) Only limited Hostel Accommodation is available, Hostel admission is subject to the rules in force from time to time Candidates under self-finance category will be considered for hostel accommodation subject to availability of seats only after accommodating students under regular category, with a different Hostel fee structure.

## APPENDIX - I ELIGIBILITY CRITERIA

### Science Stream

S. No	Course Code	Course Name	Qualifications
1	10101	M.Sc. Biotechnology	B.Sc./B.Sc. (Vocational) with any two of the following subjects – Biotechnology, Biochemistry, Botany, Zoology, Chemistry, Microbiology, Environmental Science, Human Genetics, Fisheries, Aquaculture and Mathematics, B.Sc Agriculture, B.Sc Vocational with Food Science and Quality Control
2	10102	M.Sc. Zoology– Affiliated colleges of BRAU, SKLM	B.Sc/B.Sc Vocational with Zoology (as main where ever applicable) and any two life Science subjects
3	10103	M.Sc. Geophysics	B.Sc with Physics and Maths (as main wherever applicable), and any other Science subjects
4	10104	M.Sc. Physics	
5	10105	M.Sc. Physics – Affiliated colleges of BRAU, SKLM	
6	10106	M.Sc. Geology	B.Sc with Geology (as main wherever applicable) and any other Science Subjects. Or B.Sc Science degree with any three science subjects including Physical Sciences, Mathematical Sciences and Biological Sciences.
6	10107	M.Sc. Mathematics	BA/B.Sc Mathematics (as main Wherever applicable)
7	10108	M.Sc Organic Chemistry	B.Sc/B.Sc Vocational with Chemistry, Applied Chemistry as one of the subject
8	10109	M.Sc Organic Chemistry Affiliated colleges of BRAU, SKLM	
9	10110	M.Sc Analytical Chemistry Affiliated colleges of BRAU, SKLM	

## Arts Stream

S.No	Course Code	Course Name	Qualifications
1	10201	M.Com	B.Com (Including Vocational and Restructured Courses), B.B.M
2	10202	M.Com Affiliated colleges of BRAU, SKLM	
3	10203	MA Economics	B.A. with all combinations; B.Com; B.B.M; B.Sc (Maths and Statistics)
4	10204	MA Economics Affiliated colleges of BRAU, SKLM	
5	10205	M.L.I.Sc (Library Science)	Any Graduate Degree recognized by UGC
6	10206	M.Ed.	B.Ed. / B.A. Ed/ B.Sc.Ed./ B.E.IEd / D.Ed. with graduation / B.E. & B.Tech with B.Ed. Recognized by NCTE/RCI with aggregate of 50% Marks (Subject to NCTE recognition)
7	10207	M.Ed. Affiliated colleges of BRAU, SKLM	
8	10208	M.A. Social Work	Any Degree
9	10209	M.A. Social Work Affiliated colleges of BRAU, SKLM	
10	10210	M.A. Rural Development	Any Degree
11	10211	M.A. English	B.A. Special English/ B.A. / B.Com / B.Sc. / B.A. (OL) / B.F.A / B.A.L with Part 1 General English for a minimum 200 Marks
12	10212	M.A. Telugu	B.A. / B.Com / B.Sc with telugu as subject of study / B.A. (OL) or Basha Praveena with Part 1 Telugu or B.A. or B.Com or Basha Praveena with P.O.L.
13	10213	MJMC (Journalism)	Any Graduate Degree recognized by UGC / AICTE

## APPENDIX - II

### 101 - LIFE SCIENCES

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, Eletrophoresis, 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 sucession -

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, amino acids 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

**1. Electrostatics:** Electrostatics Gauss law and its applications. Deduction of Coulomb's law from Gauss law Mechanical force on a charged conductor, Electric potentials Potential of a uniformly charged circular disc. 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. 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.

**2. 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, Boundary conditions at the dielectric surface. Capacitance of concentric spheres, cylindrical, 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.

**3. 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. 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).

**4. 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 and positive feedback -Barkhausen criterion, RC coupled amplifier and phase shift oscillator (qualitative).

**5. Digital Principles** Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction 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 Spectram** 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 Raman effect.

**2. Quantum Mechanics** Inadequacy of classical Physics: (Discussion only),Spectral radiation - Planck's law. Photoelectric effect - Einstien's photoelectric equation. Compton's effect (quantitative) experimental verification. Stability of an atom - Bohr's atomic theory. Limitations of old quantum theory. 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 Brogile waves of electron in Bohr orbits.

**3. 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. Particle in a box. Complementary principle of Bohr. Schrodinger time independent and time dependent wave equations - 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.

**4. Nuclear Physics and 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. Alpha and Beta Decays: Range of alpha particles, Geiger - Nuttall law, Gamow's theory of alpha decay. Geiger - Nuttall law from Gamow's theory. Beta spectrum - neutrino hypothesis, Fermi's theory of p-decay (qualitative). 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

**5. 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), X-ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method. 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.

**6. Nanomaterials:** Introduction, Nano particles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures - nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.

**7. 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.

## **Thermodynamics and Optics**

**1. Kinetic theory of gases:** Introduction - Deduction of Maxwell's law of distribution of molecular speeds, 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, 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 - Maxwell's 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 gas and Vander waal'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 – working and Principle of refrigeration, vapour compression type, 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 pyro-heliometer - determination of solar constant, effective temperature of sun.

**6. 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  $D^2$  lines and thickness of a thin transparent plate.

**7. 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 and with N slits - 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.

**8. 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.

**9. 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.

## **Mechanics of 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.concept of impact parameter, scattering cross-section, Rutherford scattering Eulers equation, precession of a top, Gyroscope, precession of the equinoxes

**2. Mechanics of continuous media:** Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of  $\nu$ ,  $n$ ,  $k$ . 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. Central forces, 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.

**4. Special theory of relativity:** Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

**5. 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

**6. 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 Fourier theorem and evaluation of the Fourier coefficients 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.

**7. Ultrasonic's:** 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**

**Total Marks : 100**

### **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 vector space, 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 nonhomogeneous 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 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. Principle of least squares, simple linear regression and correlation versus 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).

## 104 - 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**

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. Group – 15: Preparation and reactions of hydrazine, hydroxylamine.

Group – 16: Classifications of oxides based on (i) Chemical behavior and (ii) Oxygen content.

**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

**5. Chemistry of f-block elements:** Chemistry of lanthanides – electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides – electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

**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  $\text{H}_2\text{O}$ ,  $\text{NH}_3$  &  $\text{AlCl}_3$  ). 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** Alkenes – Preparation of alkenes. 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<sub>2</sub>O, HOX, H<sub>2</sub>SO<sub>4</sub> with mechanism and addition of HBr in the presence of peroxide (anti – Markonikov's addition). 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<sub>2</sub>, HX, H<sub>2</sub>O (Tautomerism), Oxidation with KMnO<sub>4</sub>, OsO<sub>4</sub>, 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<sub>2</sub> 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, aryl alkyl, allyl, vinyl, benzyl halides. Nucleophilic aliphatic substitution reaction-classification into  $SN_1$  and  $SN_2$  – reaction mechanism with examples – Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromobutane.

**7. Hydroxy compounds:** Nomenclature and classification of 26 behavior 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. Identification of alcohols by oxidation with  $KMnO_4$ , Ceric ammonium nitrate, Luca's reagent and phenols by reaction with  $FeCl_3$ . Chemical properties: a) Dehydration of alcohols. b) Oxidation of alcohols by  $CrO_3$ ,  $KMnO_4$ . c) Special reaction of phenols: Bromination, Kolbe-Schmidt reaction, Reimer-Tiemann reaction, Fries rearrangement, azocoupling, 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: 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. Base catalysed reactions: a) Aldol, b) Cannizzaro's reaction, c) 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  $LiAlH_4$  and  $NaBH_4$ . Analysis of aldehydes and ketones with a) 2,4-DNPH test, b) Tollen's test, c) Fehling test, d) Schiff's test e) Haloform test (with equation)

**9. Carboxylic acids and derivatives** Nomenclature, classification and structure of carboxylic acids. Methods of preparation by a) Hydrolysis of nitriles, amides b) Hydrolysis of esters by acids and bases with mechanism c) 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 and Chemical properties of carboxylic acids.

**10. 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.

**11. Nitrogen compounds:**

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1°, 2°, 3° Amines and Quaternary ammonium compounds. Preparative methods – 1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties and Chemical properties Electrophilic substitution of Aromatic amines – Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

**12. Heterocyclic Compounds** Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan, Thiophene and pyrrole – Aromatic character – Preparation from 1,4,- dicarbonyl compounds, Paul-Knorr synthesis. Properties: Acidic character of pyrrole – electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan. Pyridine – Structure – Basicity – Aromaticity – Comparison with pyrrole – one method of preparation and properties – Reactivity towards Nucleophilic substitution reaction.

**13. Carbohydrates:** Monosaccharides: (+) Glucose– Evidence for cyclic structure of glucose Pyranose structure (Haworth formula and chair conformational formula).(-) Fructose (keto-hexose) – osazone formation from glucose and fructose – Definition of anomers with examples. Interconversion of Monosaccharides: Aldopentose to Aldo-hexose (Kiliani – Fischer method). Epimers, Epimerisation – Lobry de Bruyn van Ekenstein rearrangement. Aldo-hexose to Aldopentose (D-Glucose to D- Arabinose) by Ruff degradation. Aldo-hexose to Keto-hexose [(+) Glucose to (-) Fructose] and Keto-hexose to Aldo-hexose

**14. Amino acids and proteins:** Introduction: Definition & classification of Amino acids Natural and essential amino acids. Methods of synthesis: alpha amino acids (specific examples – Glycine, Alanine, valine and leucine) Physical & Chemical properties of amino acids, Zwitterion structure – salt like character - definition of isoelectric point. Structure and nomenclature of peptides and proteins.

**15. 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. 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. Defects in crystals. Stoichiometric and non-stoichiometric defects.

### **2. Gaseous state**

Compression factors, deviation of real gases from ideal behavior. Vander Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The vander Waal's equation and the critical state. Law of corresponding states. Relationship between critical constants and vander Waal's constants. Joule Thomson effect.

### **3. Liquid state**

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.

### **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-H<sub>2</sub>O, 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, Elevation of boiling point and depression of freezing point. Experimental method of determinations. 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, 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- conductometric titrations. Single electrode potential, sign convention, Reversible and irreversible cells Nernst Equation- Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements – Potentiometric titrations

**9. Chemical kinetics:** 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. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

**10. Photochemistry:** Difference between thermal and photochemical processes. Laws of photochemistry-GrothusDraper'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-Thomson effect- coefficient. Calculation of  $w$ , 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. Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes.

## **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, 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  $\text{ClF}_3$ ,  $\text{BrF}_5$ ,  $\text{Ni}(\text{CO})_4$ ,  $\text{XeF}_2$ . 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 homonuclear and hetero-nuclear diatomic molecules ( $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{HCl}$ ,  $\text{CO}$  and  $\text{NO}$ ). 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. Enantiomers - Chiral molecules- definition of 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.

**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 ( $\sigma, \delta, n$ ) . 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. Anharmonic motion of real molecules and energy levels. (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 ( $^1\text{H-NMR}$ ) Principles-Chemical shift, NMR splitting of signals – spin-spin coupling, coupling constants. Applications of NMR (v) Spectral interpretation of IR, UV-Visible,  $^1\text{H-NMR}$  and mass spectral compounds

**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, Planes of symmetry, 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. 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.

## **105 – GEOLOGY**

**Total Marks: 100**

### **Palaeontology, Indian Geology and Economic Geology**

**Palaeontology:** Definition of palaeontology, conditions of fossilization, modes of preservation and uses of fossils. Phylum Echinodermata and Phylum Brachiopod, Phylum Mollusca and Phylum Arthropoda, Phylum Hemichordata, Phylum Coelenterata. Study of the following fossils with respect to their classification, morphology and geological distribution. Cidaris, Micraster, Holaster, Hemiaster, Terebratula, Spinifer, Rhynchonella, Productus, Turritella, Murex, Cypraea, Natica, Voluta, Pecten, Gryphaea, Arca, Cardita, Exogyra, Nautilus, Ammonoids, Belemnites, Calymene, Paradoxide, Corals and Graptolites. Plant fossils : Glossopteris, Gangam Operas, Ptylophyllum.

**Indian Geology:** Definition of stratigraphy, principles of stratigraphy, lithostratigraphy, standard geological timescale. Physiographic divisions of India with their stratigraphic and structural characteristics. Dharwar System, Cuddapah System, Vindhyan System, Kurnool System and Gondwana System. Triassic of Spiti, Jurassic of Kutch, Cretaceous of Tiruchirapalli, Deccan Traps and their Age, Siwaliks with vertebrate fossils. Geology of Andhra Pradesh. Stratigraphic contacts – boundaries between Archaean and Proterozoic; and Cretaceous and Tertiary.

**Economic Geology:** Definition of Economic Geology, Global tectonics and metallogeny – mineral resources and mineral deposits, Importance of economic minerals and rocks, ore minerals, gangue minerals (gangue). Ore, industrial minerals, tenor and grade; Syngenetic deposits, epigenetic deposits. Classification of mineral deposits – Bateman's classification modified by Jenson. Processes of formation of mineral deposits; endogenetic and exogenetic processes. Study of ore deposits of gold, copper, lead, zinc, aluminium, iron, manganese, chromium, uranium and thorium with respect to their mineralogy, uses, mode of occurrence, origin and distribution in India. Distribution of industrial minerals in India for the following industries : abrasives, cement, ceramics, glass, fertilizers and chemicals, and insulators. Fossil fuels : Coal, its origin and types of coal – Coal deposits of India. Oil and Natural Gas : Origin, migration and entrapment and distribution in India, Use of micropaleontology in oil exploration,

Gemstones and Dimensional Stones. Atomic minerals : Uraninite, pitchblende, coffenite; Beach sands : monazite, ilmenite, rutile, zircon and their uses. Mineral resources of Andhra Pradesh.

## **Petrology and Structural Geology**

**Nature and scope of Petrology** – Definition of rock, classification of rocks into igneous, sedimentary and metamorphic. Distinguishing features of the three types of rocks. **Igneous rocks:** Classification into plutonic, hypabyssal and volcanic rocks; Forms – Lava flows, intrusions, sills, laccolith, lopolith, dykes, ring dykes, cone sheets, volcanic necks, phacoliths and batholiths. Structures : vesicular, amygdaloidal, block lava, ropy lava, pillow lava, flow, jointing and sheet structures. Platy, columnar and prismatic structures. Textures – Definition of texture, micro-structure, devitrification. Allotriomorphic, hypidiomorphic, panidiomorphic, porphyritic, poikilitic, ophitic, intergranular, intersertal, trachytic, graphic and micro-graphic. Reaction structures – Corona, myrmekitic, orbicular, spherulitic, perlitic. Classification of igneous rocks – CIPW and Tyrrell tabular classification. Descriptive study of the following rocks types : granite, granodiorite, syenite, nepheline syenite, diorite, pegmatite, aplite, gabbro, anorthosite, peridotite, pyroxenite, dunite, dolerite, rhyolite, obsidian, trachyte, andesite and basalt. Composition and constitution of magma – Crystallization of magma, unicomponent and binary systems, eutectic and solid solutions. Origin of igneous rocks – Bowen's reaction principle, differentiation and assimilation. **Sedimentary rocks:** Sources of sediments – mechanical and chemical weathering, modes of transportation, stratification. Sedimentary structures : types of bedding, surface marks, deformed bedding and solution structures. Classification of sedimentary rocks : Clastic – rudaceous, arenaceous, and argillaceous; Non-Clastic – calcareous, carbonaceous, ferruginous, phosphatic, and evaporates. Descriptive study of the following sedimentary rocks – conglomerate, breccia, sandstone, grit, arkose, greywacke, shale, limestone, and shelly limestone. **Metamorphic rocks:** Definition of metamorphism, agencies of metamorphism, types of metamorphism, grades and zones of metamorphism. Metamorphic minerals – stress and antistress minerals – Structures of metamorphic rocks – Cataclastic, maculose, schistose, granulose and gneissose. Textures of metamorphic rocks – crystalloblastic, palimpsest, xenoblastic and idioblastic. Classification of metamorphic rocks - concept of metamorphic facies. Cataclastic metamorphism of argillaceous and arenaceous rocks. Thermal metamorphism of argillaceous, arenaceous and calcareous rocks. Dynamothermal

metamorphism of argillaceous, arenaceous and basic igneous rocks. Plutonic metamorphism, metasomatism and additive processes. Definition of anatexis and palingenesis. Descriptive study of the following metamorphic rocks : gneiss, schist, slate, phyllite, quartzite, marble, granulite, eclogite, amphibolite, migmatite, charnockite and khondalite.

**Structural Geology:** Definition of structural geology, aim and objectives of structural geology; Importance of study of structures, primary and secondary structures; Outcrops, attitude of beds; Strike, dip and apparent dip, and Use of clinometer. Primary structures. Folds – description, nomenclature and recognition in the field. Joints – geometrical and genetic classification. Faults – geometrical and genetic classification and recognition in the field. Effects of faults on the outcrops. Unconformities – definition, types, and recognition in the field. Distinguishing the faults from unconformities. Definitions of overlap, offlap, outlier, cleavage, schistosity, foliation and lineation.

### **Physical Geology, Crystallography and Mineralogy**

**Physical Geology:** General aspects, definition of geology – Basic assumptions of Geology – Its relationship with other sciences – Branches of geology – Aim and applications of Geology. **Earth as a planet** – It's shape, size, density – movements and their effects. Origin and age of the earth. Geological processes – exogenic and endogenic. Definition of weathering – types of weathering of rocks – physical and chemical. Definition of erosion and denudation, cycle of erosion, transportation and deposition, agents of erosion. **Rivers** : erosion, transportation and deposition of river (fluvial) cycle in different stages – Development of typical landforms by river erosion and deposition. V-shaped valley, waterfall, alluvial fan, meander, ox-bow lake, flood plane, natural plane, peneplain and delta. Types of rivers. **Glaciers** : Definition of a glacier – types – development of typical landforms by glacial erosion and deposition – cirque, U-shaped valley – changing valley; Rocks – monadocks, morains, drum-line, kama, eskors and varves, characteristic features of glaciated regions. Groundwater : storage of ground water – porosity, permeability, aquifer, water table – zone of saturation, artesian well, spring, geysers – development of typical landforms by erosion and deposition by groundwater (Karst topography), sinkhole, cavern, stalactites and stalagmites. **Seas** : Offshore profile – landforms of sea – marine deposits and coral reefs. Lacustrine deposits, atmospheric circulation, weather and climatic changes, land-air-sea interaction. Earth's heat budget and global climatic changes. **Wind** :

Development of characteristic features by winds (arid cycle), erosion and deposition – pedestal rock – mushroom topography – Inselberg – Ventifacts – loess and sand dunes. Earth movements : definition of diastrophism, epirogenic and orogenic movements – mountains, geosyncline. Basic concepts of isostasy, continental drift and plate tectonics. **Earthquakes** : causes, kinds of earthquake waves, mode of propagation, intensity of earthquakes, Richter's scale, seismograph and seismogram. Effects of earthquakes, earthquake zones, interior of the earth. **Volcanoes** : origin and products.

**Crystallography: Definition of crystal** – amorphous and crystalline states – morphology of crystals – face, edge, solid angle and interfacial angle. Forms : simple, combination, closed and open forms. **Symmetry**: Plane, axis, centre, crystallographic axes, parameters, indices, crystallographic notation – Parameter system of Weiss, Index system of Miller. **Classification** of Crystals into '7' systems. Morphological study of the following classes of symmetry : a) Cubic system – Normal (Galena) type, b) Tetragonal system – Zircon type, c) Hexagonal system – Beryl type, d) Trigonal system – Calcite type, e) Orthorhombic system – Barytes type, f) Monoclinic system – Gypsum type, and g) Triclinic system – Axinite type. **Twinning** in crystals – definition of twin, twin plane, twin axis and composition plane.

**Mineralogy: Definition of a mineral** – Classification of minerals into rock forming and ore forming minerals. Physical properties of minerals – colour, streak, play of colours, opalescence, asterism, transparency, luster, luminescence, fluorescence, form, hardness, tenacity, cleavage, parting, fracture, specific gravity, magnetic properties, electrical properties, pyro- and piezo-electricity. **Modes of mineral formation**: Occurrence and association of minerals. Chemical properties of minerals – isomorphism – solid solution – polymorphism – allotropy, pseudomorphism, radioactivity, silicate structure. **Descriptive Mineralogy** : Study of physical and chemical properties and mode of occurrence of the following mineral groups : Nesosilicate – Olivine, garnet and aluminium silicates; Sorosilicate – epidote; Cyclosilicate – beryl; Inosilicate – pyroxene and amphibole; Phyllosilicate – mica, hydrous magnesium silicate; Tektosilicate – feldspars, feldspathoids and quartz; Miscellaneous – staurolite, tourmaline, zircon, calcite, corundum and apatite. **Optical Mineralogy** : Optical properties of minerals – Isotropic and Anisotropic – Polarized light, refractive index – Double refraction, Uniaxial and Biaxial minerals – Nicol Prism and its construction, Concept of crossed nicols. Petrological (Polarizing)

Microscope – Its mechanical and optical parts – behaviour of isotropic and anisotropic mineral between crossed nicols – extinction, pleochroism, interference colour. Optical properties of important minerals.

## **201 – 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 – Topics that do not require subject specialization. General Science.

## **202 – ENGLISH**

**Total Marks: 100**

1. Literary terms, Genres, Literary Movements and Trends, Critical concepts.
2. Verb, verb patterns and structures, phrasal verbs concord, Active and Passive Voice, Prepositions, Question tags, Articles, synonyms and antonyms, one word substitutes, Note taking, confusables.
3. Comprehension – unknown poem and passage, Letter writing, Idioms, and phrases.

203 – TELUGU

Total Marks: 100

203 - తెలుగు

తెలుగు భాషా చరిత్ర - వ్యాకరణము :

ద్రావిడ భాషలు - వ్యవహారాలు - ప్రాంతాలు

ఆంధ్రము - తెనుగు - తెలుగు - పుట్టుపూర్వోత్తరాలు - వాని వ్యాప్తి

ప్రాజ్ఞన్నయ యుగ భాషా స్వరూపం

ధ్వనుల మార్పులు : వర్ణ సమీకరణం , వర్ణ విభేదం , వర్ణ వ్యత్యయం , వర్ణ సామ్యం , తాలవ్యీకరణం ,

శ్వాసత -నాదత

అర్థ విపరిణామం : అర్థ సంకోచం , అర్థ వ్యాకోచం , సభ్యోక్తి మ్యదూక్తి , అర్థ గ్రామ్యత , లక్ష్యాధారులు ,

అన్యదేశ్యాలు

ఆదాన ప్రదానాలు

మాండలిక భేదాలు - పరిచయం

వ్యాకరణం : సంఘ , సంధి పరిచ్ఛేదములు - బాల వ్యాకరణం - చిన్నయ సూరి

తెలుగు సాహిత్య చరిత్ర

తెలుగు సాహిత్య విమర్శ : 1. కావ్య ప్రకరణం 2. రస ప్రకరణం 3. రూపక ప్రకరణం 4. ఆధునిక ప్రక్రియలు

5. సాహిత్య విమర్శ - ప్రయోజనం

ప్రాచీన సాహిత్యం : 1. గంగాశంతనుల కథ - నన్నయ 2. మూషిక మార్జాల వృత్తాంతం - తిక్కన

3. వామనావతారం - పోతన 4. శ్రీ కృష్ణదేవరాయలు - నంది తిమ్మన

5. సాయుజ్యము - ధూర్జటి 6. సుభద్రా పరిణయం - చేమకూర వేంకటకవి

ఆధునిక సాహిత్యం :

1. మాకొడ్డి తెల్లదొరతనం - గరిమెళ్ళ సత్యనారాయణ
2. ఫిరదాసి లేఖ - గుర్రం జాషువా
3. చెట్టు - గెడ్డాపు సత్యం
4. దేశ చరిత్రలు - శ్రీ శ్రీ
5. హరిజన శతకం - కుసుమ ధర్మన్న
6. ధర్మ సంవాదం - పింగళి, కాటూరి
7. ఆంధ్ర వైభవం - రాయప్రోలు సుబ్బారావు

గద్య భాగం :

కథానికలు : 1. గాలివాన - పాలగుమ్మి పద్మరాజు

2. ఆకలి - కొలకలూరి ఇనాక్

3. నమ్ముకున్న నేల - కేతు విశ్వనాథ రెడ్డి

4. అమ్మకు ఆదివారం లేదా? - రంగనాయకమ్మ

నవల : బతుకాట - వి.ఆర్. రాసాని

నాటకం : వరడు - కందిమళ్ళ సాంబశివరావు

వ్యాకరణం :

సంధులు : సవర్ణదీర్ఘ, గుణ, వృద్ధి, యణాదేశ, త్రిక, గ స డ ద వాదేశ, సరళాదేశ, రుగాగమ, టుగాగమ, ఆప్రేడిత, అత్వ, ఇత్వ, ఉత్వ సంధులు.

సమాసాలు : తత్పురుష, కర్మధారయ, ద్వంద్వ, ద్వీగు, ఆప్రేడితములు.

చందస్సు : ఉత్పలమాల, చంపకమాల, మత్తేభం, శార్దూలం, కందం, ఆటవెలది, తేటగీతి, సీసం.

అలంకారాలు : ఉపమ, రూపక, ఉత్పేక్ష, స్వభావోక్తి, అతిశయోక్తి, అర్థాంతరన్యాస, దృష్టాంతం.

శబ్దాలంకారాలు

**Financial Accounting:**

Financial accounting: concept, need, objectives & scope: accounting principles – basic concepts and conventions; Accounting standards: accounting cycle and accounting equations; classification and rectification of errors. Depreciation provisions. Final accounts: manufacturing, trading and profit and loss account; balance sheet; adjustment entries; accounts of non-profit organizations.

Partnership account: final accounts; change in profit sharing ratio. Admission and retirement of a partner; death of partner; amalgamation of partnership firms; dissolution of partnership firm: modes of dissolution of a firm; accounting entries; insolvency of partners; gradual realisation of assets and piecemeal distribution.

**Cost and Management accounting:**

Nature and scope of cost accounting: cost concepts & classification; methods & techniques. Accounting for material; Accounting for Labour; Incentive schemes. Overheads: classification, allocation, apportionment and absorption of overheads. Unit costing; job costing; contract costing, process costing (process losses, valuation of work in progress, joint and by-products).

Introduction to management accounting, budgeting and budgetary control; Standard costing and variance analysis; marginal costing and its applications in decision making; Responsibility Accounting.

**Economics:**

Micro Economics: Demand & Supply; Consumer Theory; Production and Cost; Market structures; Perfect competition; Imperfect competition; Income Distribution and Factor Pricing.

Macro Economics: National Income Determination; Fiscal policy; Monetary policy; Inflation; GDP and Price level in short and long run; Money in modern economy.

**Business Organization:**

Definition, nature and scope of business, business and society, social responsibility of business, factors determining the size of business unit. Forms of business organization.

Monopolistic combination, production management, rationalisation & methods of remunerating labour.

Organization process – importance, principles, various aspects of organization, organization structure, departmentation, line and staff relationships, span of control, delegation of authority, decentralization.

### **Business Laws:**

Law of contract: offer and acceptance; capacity of parties to contract; free consent; consideration; performance of contract; remedies for breach of contract; indemnity & guarantee, bailment and pledge; contract of agency. Negotiable instrument Act 1881: concept and types of negotiable instruments; dishonour and discharge of negotiable instruments.

Sale of goods Act 1930: formation of contract of sale; goods and their classification, price; conditions and warranties; provision of Indian partnership Act 1932; dissolution of a firm and consequence, registration of firms, effect of non-registration.

Competition Act, purpose, prohibition of Anti- competitive agreement, prohibition of dominant position combinations.

### **Banking and insurance:**

Introduction of Indian Financial System; Reserve Bank of India: organization, management and functions; credit creation and credit control; monetary policy. Commercial banks: meaning and functions, structure and recent developments in commercial banking in India; E-banking.

Introduction to Insurance: Life and general insurance; purpose, need and principles of insurance. Claim assessment and verification.

Double insurance; measures of indemnity: claims settlement procedures. Accident and motor insurance: policy and claims settlement procedures.

### **E-Commerce**

Features of Electronic Commerce; Distinction between E-Commerce and E-Business; Types of Business Models: B2B, B2C, C2C; Benefits and Limitations of e-Commerce; Apps. Integration and E-Business suits – ERP, e-SCM, e CRM; Methods and benefits of E-Payment Systems; E-Marketing; Applications and issues; Process; Methods; E-Content development and Deliveries; Major technologies used in e-Education; Online Testing; Methods; Future Trends. Ticketing; Mee-Seva; Government and Consumer Services; E-Retailing; E-Groceries; Security challenges.

### **GST Fundamentals:**

Basic concepts; administration; powers of officers; registration; rate of taxes; scope of supply levy an collection; time and value of supply; E-weigh bills, filing of returns; refunds; GST applies and revisions.

## **Business Environment**

Business Environment – Meaning – Macro and Micro Dimensions of Business Environment – Economic – Political – Social – Technological – Legal – Ecological – Cultural – Demographic – Changing Scenario and implications – Indian Perspective – Global perspective. Meaning of Economic growth – Factors Influencing Development – Balanced Regional Development. Rostow’s stages of economic development – Meaning – Types of plans – Main objects of planning in India – NITI Ayog and National Development Council – Five year plans. Economic Reforms and New Economic Policy – New Industrial Policy – Competition Law – Fiscal Policy – Objectives and Limitations – Union budget – Structure and importance of Union budget – Monetary policy and RBI. Concept of Social Justice – Schemes – Political Stability – Legal Changes.

### APPENDIX – III (A)

Statement showing the particulars of course wise seats intake Dr.B.R.Ambedkar University, Srikakulam, campus Admissions for the Academic Year 2019-20.

Sl.No	Name of the college	Course	Regular	Self Finance	No. of Seats intake
01	Dr.B.R.A.U, Sklm	M.Sc Bio-Technology	24	6	30
02	Dr.B.R.A.U, Sklm	M.Sc Org-Chemistry	24	6	30
03	Dr.B.R.A.U, Sklm	M.Sc Geology	12	3	15
04	Dr.B.R.A.U, Sklm	M.Sc Maths	32	8	40
05	Dr.B.R.A.U, Sklm	M.Sc Geo-Physics	12	3	15
06	Dr.B.R.A.U, Sklm	M.Sc Physics	32	8	40
07	Dr.B.R.A.U, Sklm	M.Com	40	10	50
08	Dr.B.R.A.U, Sklm	M.A Economics	32	8	40
09	Dr.B.R.A.U, Sklm	M.A English	32	8	40
10	Dr.B.R.A.U, Sklm	M.L.I.Sc	32	8	40
11	Dr.B.R.A.U, Sklm	M.Ed	32	8	40
12	Dr.B.R.A.U, Sklm	M.A Social Work	32	8	40
13	Dr.B.R.A.U, Sklm	M.A Telugu	32	8	40
14	Dr.B.R.A.U, Sklm	M.A Rural Development	32	8	40
15	Dr.B.R.A.U, Sklm	Master of Journalism and Mass Communication (MJMC)	24	6	30

**Dr.BRAUCET-SKLM (2019)**

**SCIENCE COURSES FEE STRUCTURE FOR UNIVERSITY CAMPUS 2019–20 Academic Year**

S.No.	Courses in Dr.B.R.AMBEDKAR UNIVERSITY	Regular(R)/ Self Finance(SF)	Tuition Fee Rs	Spl. Fee Rs	Adm. Fee Rs	Caution Deposit Rs	Exam. Fee Rs	Total Tuition Fee Rs	Fee Eligibility for SC/ST/BC/EBC Rs.
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	M.Sc. Bio-Tech	R	20,000	1,450	150	200	1,540	23,340	3,340
		SF	30,000	1,450	150	200	1,540	33,340	13,340
2	M.Sc. Org-Chem.	R	3620	1,450	150	200	1,540	6960	1,890
		SF	30,000	1,450	150	200	1,540	33,340	13,340
3	M.Sc Geology	R	3620	1,450	150	200	1,540	6960	1,890
		SF	20,000	1,450	150	200	1,540	23,340	3,340
4	M.Sc. Maths.	R	3620	1,450	150	200	1,540	6960	1,890
		SF	15,000	1,450	150	200	1,540	18,340	1,890
5	M.Sc. Geo-Physics	R	3620	1,450	150	200	1,540	6960	1,890
		SF	20,000	1,450	150	200	1,540	23,340	3,340
4	M.Sc. Physics	R	20,000	1,450	150	200	1,540	23,340	3,340
		SF	30,000	1,450	150	200	1,540	33,340	13,340

**ARTS & COMMERCE COURSES FEE STRUCTURE FOR UNIVERSITY CAMPUS 2019-20 Academic Year**

S.No.	Courses in Dr.B.R.AMBEDKAR UNIVERSITY	Regular(R)/ Self Finance(Sf)	Tuition Fee Rs	Spl. Fee Rs	Adm. Fee Rs	Caution Deposit Rs	Exam. Fee Rs	Total Tuition Fee Rs	Fee Eligibility for SC/ST/BC/EBC Rs.
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	M.Com.	R	2,130	1,450	55	100	1,540	5,275	1,695
		SF	6,000	1,450	55	100	1,540	9,145	1,695
2	M.A. Economics	R	1,900	1,450	55	100	1,540	5,045	1,695
		SF	6,000	1,450	55	100	1,540	9,145	1,695
3	M.A. English.	R	1,790	1,450	55	100	1,540	4,935	1,695
		SF	6,000	1,450	55	100	1,540	9,145	1,695
4	M.L.I.Sc	R	1,900	1,450	55	100	1,540	5,045	1,695
		SF	8,000	1,450	55	100	1,540	11,145	1,695
5	M.Ed	R	4355	1,450	55	100	1,540	7,500	1,695
		SF	11,855	1,450	55	100	1,540	15,000	1,695
6	M.A. Social Work	R	2,635	1,450	55	100	1,540	5,780	1,695
		SF	6,000	1,450	55	100	1,540	9,145	1,695
7	M.A. Telugu	R	1,780	1,450	55	100	1,540	4,925	1,695
		SF	6,000	1,450	55	100	1,540	9,145	1,695
8	M.A. Rural Development	R	1,900	1,450	55	100	1,540	5,045	1,695
		SF	6,000	1,450	55	100	1,540	9,145	1,695
9	Master of Journalism and Mass Communication (MJMC)	R	1,900	1,450	55	100	1,540	5,045	1,695
		SF	6,000	1,450	55	100	1,540	9,145	1,695

**APPENDIX – III(B)**  
**Dr.B.R.Ambedkar University-Srikakulam**  
**Affiliated PG Colleges**

Statement showing the particulars of course wise seats intake Affiliated Colleges of Dr.B.R.Ambedkar University-Srikakulam,

Admissions for the Academic Year 2019 – 20.

S.No.	Name of the college	Course	Regular	Self Finance	Mg. Seats	No. of Seats intake
01	Aditya Degree & P.G. College SKL	M.Sc. Org-Chem	--	36	6	42
02	Gayathri College of Mg. MunasebPeta SKLM	M.Sc. Anal.Chem	--	36	6	42
	Gayathri College of Mg. MunasebPeta SKLM	M.Sc. Org-Chem	--	36	6	42
	Gayathri College of Mg. MunasebPeta SKLM	M.Sc. Physics	--	36	6	42
03	Govt. Degree & P.G. College,(Men)SKLM	M.Sc. Org-Chem	--	30	--	30
	Govt. Degree & P.G. College,(Men)SKLM	M.Com.	--	40	--	40
	Govt. Degree & P.G. College,(Men)SKLM	M.A. Telugu	--	40	--	40
04	Govt. Degree& P.G. College,(W)SKLM	M.Sc. Org-Chem.	--	30	--	30
	Govt. Degree& P.G. College,(W)SKLM	M.Sc. Zoology	--	30	--	30
	Govt. Degree& P.G. College,(W)SKLM	M.A. Telugu	--	30	--	30
05	SSR Degree & PG College ,Srikakulam	M.Sc. Org-Chem.	--	30	3	33
06	Sun Degree & P.G College, SKLM	M.Sc. Org-Chem.	--	30	--	30
07	Rangumudri M.Ed. College, Irruvada	M.Ed.	--	50	--	50
08	B.S & J.R M.Ed. College, Akkavaram-Tekkali	M.Ed.	--	50	--	50

**Dr.BRAUSKLMCET – 2019****COURSE wise FEE STRUCTURE for Affiliated colleges 2019 – 20 Academic Year**

S.No	Courses in Dr.B.R.AMBEDKAR UNIVERSITY	Self Finance (SF)	Tuition Fee Rs	Spl. Fee Rs	Adm. Fee Rs	Caution Deposit Rs	Exam. Fee Rs	Total Tuition Fee Rs	Fee for Eligible SC/ST/BC/EBC students Rs.
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	M.Sc.Org-Chem. (In Affiliated Colleges un Aided)	SF	32,045	1,450	150	200	1,540	35,385	15,385
2	M.Sc.Anal.Chem.(In Affiliated Colleges un Aided)	SF	32,045	1,450	150	200	1,540	35,385	15,385
3	M.Sc. Zoology (In Affiliated Colleges un Aided)	SF	32,045	1,450	150	200	1,540	35,385	15,385
4	M.Sc. Physics (In Affiliated Colleges un Aided)	SF	32,045	1,450	150	200	1,540	35,385	15,385
5	M.Com. (In Affiliated Colleges un Aided)	SF	11,600	1,450	55	100	1,540	14,745	1,695
6	M.A.Economics(In Affiliated Colleges un Aided)	SF	11,600	1,450	55	100	1,540	14,745	1,695
7	M.A. Social Work(In Affiliated Colleges un Aided)	SF	8,100	1,450	55	100	1,540	11,245	1,695
8	M.A. Telugu(In Affiliated Colleges un Aided)	SF	11,600	1,450	55	100	1,540	14,745	1,695
9	M.A. Political Science (In Affiliated Colleges un Aided)	SF	8,100	1,450	55	100	1,540	11,245	1,695
10	M.Ed. Education (In Affiliated Colleges un Aided)	SF	36,945	1,450	55	100	1,540	40,090	20,090

## APPENDIX - IV

### Tests and Test Codes

S.No	Test Code	Test Title	Courses
1	101	Life Sciences	M.Sc Biotechnology, M.Sc Zoology
2	102	Physical Sciences	M.Sc Geophysics, M.Sc Physics
3	103	Mathematical Sciences	M.Sc Mathematics
4	104	Chemical Sciences	M.Sc Organic Chemistry, M.Sc Analytical Chemistry
5	105	Geology	M.Sc Geology
6	201	Humanities and Social Sciences	M.A Economics, M.A Rural Development, M.A Social Work, M.Li.Sc, M.Ed, MJMC
7	202	English	M.A English
8	203	Telugu	M.A Telugu
9	204	Commerce	M.Com

### Test Centers

(The convener has the authority to cancel a test center if the number of candidates opting a particular center is less than 200)

Center Code	Center
1	Srikakulam
2	Palasa
3	Bobbili
4	Vijayanagaram
5	Visakhapatnam
6	Rajahmundry
7	Vijayawada
8	Tirupathi