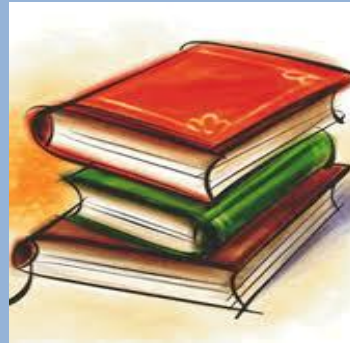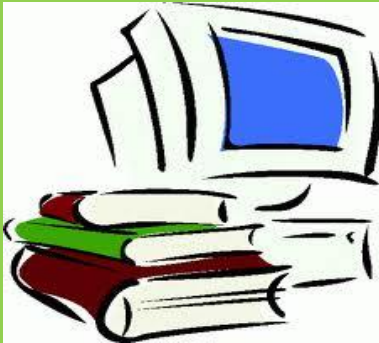# AP EAMCET 2015

**(Engineering, Agriculture and Medical Common Entrance Test
Conducted by JNTUK, Kakinada on behalf of APSCHE)**

Date of Examination: 08-05-2015
(10.00 A.M. to 1.00 P.M.)

INSTRUCTION BOOKLET
ENGINEERING

ENGINEERING, AGRICULTURE & MEDICAL COMMON ENTRANCE TEST
(being conducted on behalf of APSCHE)

Jawaharlal Nehru Technological University Kakinada
Kakinada, Andhra Pradesh, INDIA – 533003

Andhra Pradesh State Council of Higher Education
Masab Tank Campus , Mahaveer Marg
Opp. Mahaveer Hospital, Hyderabad, Telangana – 500 028

ENGINEERING

ENGINEERING, AGRICULTURE & MEDICAL COMMON ENTRANCE TEST
(being conducted on behalf of APSCHE)

AP EAMCET–2015

FOR ENTRANCE TEST RELATING TO PROFESSIONAL COURSES IN

B.E./B.Tech./B.Tech.(Ag. Engg.)/B.Tech.(Diary Technology)/B.Tech.(FST)/
B.Tech. (BioTechnology) / B.Sc.(CA & BM) (MPC)/B.Pharm.(MPC)/Pharm-D(MPC)

AP EAMCET – 2015 (Engineering) on 08-05-2015 from 10-00 A.M. to 1-00 P.M.

Note: Information about the Entrance test is also available in the Website **http://www.apeamcet.org**

LAST DATES FOR SUBMISSION OF ONLINE APPLICATION	
WITHOUT LATE FEE	**11-04-2015**
WITH LATE FEE Rs. 500/-	**16-04-2015**
WITH LATE FEE Rs. 1000/-	**22-04-2015**
WITH LATE FEE *Rs. 5000/-	**02-05-2015**
WITH LATE FEE *Rs. 10000/-	**06-05-2015**

*For candidates submitted with late fee of Rs.5,000/- and Rs. 10,000/-
Test Centre will be allotted only at Kakinada

Address for Correspondence:

CONVENER, AP EAMCET - 2015

GROUND FLOOR, ADMINISTRATIVE BUILDING

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA - 533003

Note: Candidates interested in applying for **Bachelor of Architecture (B.Arch.)** course in Andhra Pradesh / Telangana are advised to take **"National Aptitude Test in Architecture" (NATA)** an online exam conducted by Council of Architecture, New Delhi. For details, candidates are requested to refer to website: **www.nata.in.** A separate notification will be issued for counseling for students seeking admission in Bachelor of Architecture course. For more details refer page No.23 of this booklet.

AP EAMCET - 2015 (Engineering)

A Common Entrance Test designated as "Engineering, Agriculture & Medical Common Entrance Test" (AP EAMCET – 2015) will be conducted by JNT University Kakinada for the academic year 2015-2016 for admission into the First Year of Professional Courses i.e. B.E. / B.Tech. / B.Tech.(Ag. Engg.) / B.Tech.(Diary Technology) / B.Tech. (BioTechnology) / B.Tech.(FST) / B.Sc. (CA & BM) (MPC)/B.Pharm. (MPC) / Pharm-D (MPC)

I. PARTICULARS OF AP EAMCET – 2015

❖ The Test is on **08-05-2015** between **10.00 A.M. and 1.00 P.M.**

❖ The Entrance test is of 3 hour duration and the question paper consists of total 160 questions comprising of 80 questions in Mathematics, 40 questions in Physics and 40 questions in Chemistry.

❖ **All questions are of objective type (multiple choice) only and each question carries one mark. The syllabus in Mathematics, Physics and Chemistry is furnished in Annexure–I. The model questions and model OMR Response sheet along with instructions are given in Annexure - II and Annexure-V respectively.**

II. ELIGIBILITY TO APPEAR FOR AP EAMCET – 2015

Candidates satisfying the following requirements shall be eligible to appear for AP EAMCET-2015:

a. Candidates should be of Indian Nationality or Persons of Indian Origin (PIO) / Overseas Citizen of India (OCI) Card Holders.

b. Candidates should belong to the state of Andhra Pradesh / Telangana. The candidates should satisfy Local / Non-Local status requirements as laid down in the Andhra Pradesh / Telangana. Educational Institutions (Regulation of Admission) order, 1974 as subsequently amended (See Annexure III).

c. For Engineering, B.Pharmacy (M.P.C), B.Tech. (Dairy), B.Tech. (Ag. Engineering), B.Tech. [Food Science and Technology (FS & T)], B.Sc. [Commercial Agriculture and Business Management (CA & BM)] courses:

(i) Candidates should have passed or appeared for the final year of Intermediate Examination (10+2 pattern) with Mathematics, Physics and Chemistry as optionals or related vocational courses in the fields of Engineering and Technology, conducted by the Board of Intermediate Education, Andhra Pradesh / Telangana, along with bridge course or courses conducted by it for candidates enrolled from academic year **2000** onwards, or any other examination recognized as equivalent thereto by the Board of Intermediate Education, Andhra Pradesh / Telangana.

<div align="center">OR</div>

Candidates should have passed or appeared at the final year of the Diploma examination in Engineering conducted by the State Board of Technical Education and Training, Andhra Pradesh / Telangana or any other examination recognized as equivalent thereto by the State Board of Technical Education and Training, Andhra Pradesh / Telangana.

(ii) a) In the case of Engineering, Pharmacy courses, candidates should have completed 16 years of age as on 31st December of the year of admission. There is no upper age limit.

b) In the case of B.Tech. (Dairy Technology), B.Tech. (Ag. Engineering), B.Tech. (FS & T) and B.Sc. (CA & BM), candidates should have candidates should have completed 17 years of age as on 31st December of the year of admission and an upper age limit of 22 years for all the candidates and 25 years in respect of Scheduled Caste and Scheduled Tribe candidates as on 31st December of the year of Admissions.

d. (i) For Pharm-D course candidates should have passed or appeared for the final year of Intermediate Examination (10+2 pattern) with Physics, Chemistry and Mathematics as optionals conducted by the Board of Intermediate Education, Andhra Pradesh / Telangana or any other examination recognized by the Board of Intermediate Education, Andhra Pradesh / Telangana, as equivalent thereto or should have passed or appeared at the final year of the Diploma Examination in Pharmacy course conducted by the Andhra Pradesh / Telangana State Board of Technical Education and training.

(ii) Candidate should obtain atleast 45% marks (40% in case of candidate belongs to reserved category) in the subjects specified taken together in the qualifying examination.

(iii) The candidates should have completed 17 years of age as on 31st December of the year of admission to the above course.

III. GENERAL INFORMATION / INSTRUCTIONS:

a. **The Convener, AP EAMCET – 2015 reserves the right to reject the application of the candidate at any stage, if:**
   (i) The Online Application Form is incomplete.
   (ii) The candidate fails to satisfy the eligibility conditions.
   (iii) Any false or incorrect information is furnished.
   (iv) The Online Application Form is submitted after the due date.
   No correspondence will be entertained in this regard.
b. The Convener is not responsible for non-receipt of application by the notified date and time for any reason.

IV. MEDIUM OF ENTRANCE TEST:

The question paper contains questions in "English" and "Telugu" medium. Candidates, who have studied the qualifying examination in Urdu medium and wish to avail assistance for translating the questions into Urdu, **will be allotted a Test Centre at Kakinada only.**

V. REGISTRATION FEE:

Payment of Registration Fee for submission of Online Application Form is the first step and the Registration Fee is Rs.250/- which has to be paid through the following modes:

a) AP ONLINE / TS ONLINE b) CREDIT CARD / DEBIT CARD

VI. SAME CENTRE FOR CANDIDATES APPEARING FOR BOTH ENGINEERING AND AGRICULTURE & MEDICAL:

Candidates of E – Category who are eligible and desirous of taking the test in AM - Category, in addition to the test for E - Category should **select the option Both (E & AM Category) together,** during the submission of the Online Application Form, so that same Test Centre can be allotted to them for both the tests. If this instruction is not followed, the candidate may be allotted different Test Centres for E & AM category tests and Convener, AP EAMCET-2015 is not responsible in allotment of different centres.

VII. REGIONAL CENTRES FOR ENTRANCE TEST:

S. No.	Regional Centre	Name of the Regional Coordinator and Addresses with Contact Details
1.	ANAKAPALLI	Sri. G. Govinda Naidu Head of Computer Engineering, Govt. Polytechnic, Anakapalli Ph: 0891 – 2565520
2.	AMALAPURAM	Sri. V. Krishna Mohan Head of Commerce, SKBR College, Amalapuram, East Godavari Dist. O: 08856 – 232077
3.	ANANTAPUR	Dr. K. Prahlada Rao Principal, JNTUA College of Engg. (Autonomous), Sir M. V. Road, Anantapur - 515002 Ph:08554273013
4.	BHIMAVARAM	Sri. P. Ramakrishanam Raju Principal, DNR College, Bhimavaram, West Godavari Dist. O: 08816 – 224072
5.	CHITTOOR	Dr. G. Anand Reddy Principal, PVKN Govt. College, Vellore Road, Chittoor - 517002 Ph: 0857 - 2241768
6.	ELURU	Dr. G. Samba Siva Rao Principal, Sir C. R. Reddy College of Engineering, Vatluru, Eluru - 534007 Ph:08812 - 230840
7.	GUNTUR	Dr. Siddiah Professor & Principal, ANU College of Engg. & Technology, Acharya Nagarjuna University, Nagarjuna Nagar, Guntur - 522510 Ph: 0863-2346251
8.	KADAPA	Dr. S. Raghunatha Reddy Professor in Commerce, Yogi Vemana University, YSR Kadapa – 516002 Ph: 0856-22442
9.	KAKINADA	Dr. P. Subba Rao Vice – Principal, University College of Engg. Kakinada (Autonomous) JNTUK, Kakinada – 533003 Ph:0884 – 2300822
10.	KURNOOL	Dr. B. Sreenivasa Reddy Principal, G. Pulla Reddy Engg. College (Autonomous), Pulla Reddy Naga, Nandyal Road, Kurnool - 518007 Ph:08518 - 270957 / 271017
11.	MACHILIPATNAM	Smt. V. Usha Rani Principal, The Hindu P. G. College, Machilipatnam, Krishna District – 521001 Ph:08672 - 222862
12.	NANDYAL	Prof. M. Rama Subba Reddy Principal, Govt, Polytechnic College, Nandyal, Kurnool District Ph: 08514 – 242974
13.	NARASARAOPET	Prof. P.V. Srinivasa Rao Principal, SSN Degree College, Narsaraopet, Guntur District. Ph: 08647 – 222011
14.	NELLORE	Er. Yelchuri Rama Mohana Rao Principal, Govt. Polytechnic (Boys), Venkateaswarapuram, SPSR Nellore - 524005 Ph:08622250904
15.	ONGOLE	Sri Z. Ramesh Babu Principal, DA Govt. Polytechnic, Housing Board Colony, Ongole – 523002 Ph: 08592 - 233046
16.	PRODDUTUR	Prof. G. Jayachandra Reddy Principal, Yogi Vemana University, YSR Kadapa - 516002 Ph:08564254770
17.	SRIKAKULAM	Sri B. Polisu Principal, Govt. Degree College (Men), Near Kodi Rammurthy Stadium, Srikakulam - 532001 Ph: 08942-222383
18.	TIRUPATHI	Prof. G.N. Prathip Kumar

19.	VIJAYAWADA	Dr. A. V. Ratna Prasad Principal, V. R. Siddhartha Engg. College (Autonomous), Kanur, Vijayawada - 520007 Ph: 08662582333
20.	VISAKHAPATNAM	Dr. K. Venkata Subbaiah Professor of Mechanical Engg, AU College of Engg. (Autonomous) University Campus, Andhra University, Visakhapatnam - 530003 Ph: 08912844999
21	VIZIANAGARAM	Dr. G. Yesuratnam Principal, University College of Engg., JNTUK, Dwarapudi (PO), Contonment (Via) Vizianagaram (Dist.) - 535003 Ph: 08922277911
22	KAKINADA	AP EAMCET – 2015 Office, Ground Floor, Administrative Building, JNTUK, Kakinada – 533003 Phs: 0884 – 2356255 / 2340535

Note: 1. The Convener reserves the right to add or delete some Test Centres from the list of Regional Centres notified.

2. The Convener reserves the right to allot the candidates to any Regional Centre other than that opted by the candidates.

3. Candidate has to submit not more than one application either for 'E' or 'AM' or 'E&AM' category test. If any candidate submits more than one application for one category, the Convener reserves the right to reject all the applications or accept any one of them only.

VIII. HELP LINE CENTRE (HLC) FOR CERTIFICATE VERIFICATION & OPTIONS ENTRY AT THE TIME OF ADMISSION INTO THE PROFESSIONAL COURSES

All the candidates appearing for AP EAMCET – 2015 are hereby informed to choose the AP EAMCET – 2015 **HELP LINE CENTRE (HLC)** of his/her choice during Online Application Submission process.

These HLCs are for Document Verification / Certification Verification and Online Options Entry for AP EAMCET – 2015 Counseling for Admission into Professional Courses i.e B.Tech. (Bio-Tech) / B. Pharmacy / B.Tech. (Food Science and Technology (FST) and Pharma-D as per the schedule which will be notified by the CONVENER (Admissions) after declaration of AP EAMCET – 2015 resluts.

However, for admission into any other professional courses, the candidates are advised to see the notification issued by the Competent authority after the declaration of AP EAMCET – 2015 results.

List of Help Line Centers (HLCs) for AP EAMCET – 2015 (Admissions) Counseling

S.No	Help Line Center	S.No	Help Line Center
1	Anantapur, Anantapur District	17	Kurnool, Kurnool District
2	Hindupur, Anantapur District	18	Nandyal, Kurnool District
3	Kalyandurg. Anantapur District	19	Srisailam, Kurnool District
4	Chittor, Chittor District	20	Nellore, Nellore District
5	Tirupati, Chittor District	21	Gudur, Kurnool District
6	Madanapally, Chittor District	22	Ongole, Prakasam District
7	Kakinada, East Godavari District	23	Kandukur, Prakasam District
8	Rajahmundry, East Godavari District	24	Srikakulam, Srikakulam District
9	Guntur, Guntur District	25	Visakhapatnam, Visakhapatnam District
10	Narsaraopet, Guntur District	26	Narsipatnam, Visakhapatnam District
11	Kadapa, Kadapa District	27	Bheemunipatnam, Visakhapatnam District
12	Proddatur, Kadapa District	28	Vizianagaram, Vizianagaram District
13	Rajampet, Kadapa District	29	Eluru, West Godavari District
14	Vijayawada, Krishna District	30	Tanuku, West Godavari District
15	Gannavaram, Krishna District	31	Bhimavaram, West Godavari District
16	Machilipatnam, Krishan District		

NOTE: Every candidate has to select only one Help Line Center (HLC) of his/her choice for certificate verification and option entry. Candidate has to attend for the above HLC chosen. **Request for the change of HLC will be not allowed once chosen.**

IX. SUBMISSION OF ON-LINE APPLICATION FOR AP EAMCET – 2015

Application should be submitted through **online** mode only.

The following information must be kept ready for filling the details during Online submission:
   a.   Hall ticket Number of Qualifying Examination
   b.   Hall ticket Number of S.S.C. or equivalent
   c.   Date of Birth
   d.   Caste in case of SC/ST/BC candidates
   e.   PH, NCC, Sports etc.
   f.   Income Upto One Lakh or Up to Two Lakhs or More than Two Lakhs (Rupees)
   g.   Study or Residence or relevant certificate for proof of local status (last 12 years)
   h.   Choice of Help Line Center is for Certificate Verification and options at the time of admission.

Note: The above certificates are to be submitted during the counseling for admission.

Online submission:

For Online submission, visit the website **www.apeamcet.org.** A candidate has to pay Rs.250/- as Registration Fee and late fee (if applicable) by opting any of the following two modes of payment: (a) AP ONLINE / TS ONLINE (b) Debit / Credit Card. After filling the Online Application Form with the required details, the candidate is required to verify all the details carefully and press Submit button. Filled in Online Application Form will be generated which contains Registration Number along with filled in details. The candidate is required to take printout of Filled In Online Application Form and it is to be submitted to the Invigilator during the examination **after affixing a recent color photograph duly attested by the Gazetted Officer or Principal of the College where studied qualifying examination.** The candidate should use the Registration Number for future correspondence.

X.   Mere appearance and qualifying at AP EAMCET-2015 does not confer any right for admission into professional courses. Candidate has to fulfill the eligibility criteria laid down in the relevant G.O at the time of admission.

XI.   QUALIFYING MARKS FOR AP EAMCET – 2015
The qualifying percentage of marks for the AP EAMCET-2015 is 25% of the maximum marks considered for ranking. However, for candidates belonging to Scheduled Caste and Scheduled Tribe, no minimum qualifying mark is prescribed. But their admission will be limited to the extent of seats reserved for such categories (vide G.O.Ms. No. 179, LEN&TE, dated 16.06.1986).

XII.   AP EAMCET-2015 RESULTS
   1. Evaluation: Every care will be taken to avoid errors in the evaluation, checking, scrutiny, tabulation and ranking.

   2. Ranking:
   a.   Candidates shall be ranked in the order of merit as explained in the Annexure-IV.
   b.   Rank obtained in AP EAMCET-2015 is valid for admission to the courses mentioned in the application form for the academic year 2015-2016 only.
   c.   Rank card shall be downloaded from the website **www.apeamcet.org**
   d.   Rank obtained with the benefit of relaxation of the minimum qualifying marks at AP EAMCET-2015 by any candidate claiming as SC/ST Category will be cancelled in case the claim is found to be invalid at the time of admission to any course of study in any participating University / Institution.

XIII.   The candidates should preserve the Filled In Online Application Form, the Hall Ticket and the Rank Card to produce them when called for verification.

XIV.   **Any malpractice in AP EAMCET-2015 will be dealt with as per rules in force vide G.O.Ms.No: 114, Edn / (IE) Dt: 13th May 1997 for the CET.**

XV.   The OMR Answer Sheets of AP EAMCET-2015 will be preserved for six months from the date of publication of results, after which they shall be disposed off.

XVI.   In any litigation concerning AP EAMCET-2015 Test, Convener is the person to sue and be sued. The Convener (Examination), AP EAMCET – 2015 is not responsible for allotment of seats at the time of admissions. The Commissioner of Technical Education, Andhra Pradesh is the Convener for the Admissions.

XVII.   Any litigation concerning AP EAMCET-2015 shall be subject to the jurisdiction of the A.P. High Court, Hyderabad only.

XVIII.   HALL TICKET
The candidate should download the Hall Ticket from website **http://www.apeamcet.org**

XIX.   COUNSELLING AND ALLOTMENT OF SEATS
The list of institutions for allotment of candidates with intake in each discipline and category, as per reservations through AP EAMCET – 2015 would be released in the **Information Booklet** for Counseling in due course and the same information would also be released on website **http://www.apsche.org**

The following Proforma I, II and III are to be submitted at the time of counseling to claim nativity, community and local status.

PROFORMA – I

REVISED PROFORMAAS PER G.O.Ms.No.58, SOCIAL WELFARE (J) DEPT. DATED 12.05.1997
ANDHRA PRADESH GAZETTE EXTRAORDINARY PART-I

Serial No.   **FORM III**

S.C.   District Code :

S.T.   Emblem   Mandal Code :

B.C.   Village Code :

Certificate No.:

COMMUNITY, NATIVITY AND DATE OF BIRTH CERTIFICATE
(Integrated Community Certificate)

1. This is to certify that Sri / Smt./Kum _____
    Son/Daughter of Sri _____
    of Village/ Town _____
    Mandal _____
    District of the state of Andhra Pradesh / Telangana belongs to

    _____
    Community which is recognized as SC/ST/BC under :
    The Constitution (Scheduled Castes) Order, 1950
    The Constitution (Scheduled Tribes) Order, 1950
    G.O.Ms.No.1793, Education, dated 25.09.1970 as amended from time to time BCs, SCs, STs list (Modification) Order 1956, SCs and STs (Amendment) Act, 1976.
2. It is certified that Sri / Smt. / Kum. _____
    is a native of _____District of
    Andhra Pradesh / Telangana.
3. It is certified that the place of birth of Sri / Smt. / Kum. _____ Village / Town _____
    Mandal _____ District of Andhra Pradesh / Telangana.
4. It is certified that the date of birth of Sri / Smt. / Kum._____ is Day _____ Month _____ Year _____
    (in words _____) as per the declaration
    given by his / her father / mother / guardian and as entered in the School records where he / she studied.

                                                               Signature:
                                                               Date:

(Seal)   **Name in Capital letters:**
                                                               Designation:

Explanatory Note:
1) While mentioning the community, the competent Authority must mention the sub-caste (in case of SCs) and Sub-Tribe or Sub-Group (in case of STs) as listed out in the SCs and STs (Amendment) Act, 1976.

PROFORMA – II

RESIDENCE CERTIFICATE IN SUPPORT OF APPLICATION

1. It is hereby certified:
    a. That Mr / Kum_____ son / daughter of
    Sri / Smt. _____ a candidate for admission to the course
    appeared for the first time for the _____examination (being the minimum qualifying
    examination for admission to the course mentioned above) in _____(month) _____ (year).

b. That in the 7 years, immediately preceding the commencement of the aforesaid examination he / she has resided in the following place / places falling within the area in respect of the AU/OU/SVU region (Tick appropriate one).

S.No.	Period	Village	Mandal	District
1				
2				
3				
4				
5				
6				
7				

2. The above candidate is, therefore, a local candidate in relation to the area specified in Paragraph 3(1)(2)(3) of the Andhra Pradesh Educational Institution (Regulation of Admissions) Order 1974 as amended.

                                                             Officer of the Revenue Department
                                                                  (Issued by the competent
                                                                        authority of Revenue Dept.)

PROFORMA – III

CERTIFICATES IN SUPPORT OF NON-LOCAL STATUS FOR E - CATEGORY

(A) Certificate to be furnished when the candidate has resided in the state for a period of 10 years
(Read Instructions under 3(a) of Annexure (III) of Instruction Booklet of admission)

This is to certify that Mr./ Kum. _____
Son / Daughter of Sri. / Smt. _____
a candidate seeking admission in to professional courses (Engineering stream & Agricultural and Medical stream) through
AP   EAMCET   2015   for   the   Academic   Year   2015-15   is   a   resident
of_____
_____ (Place) in _____(District) of Andhra Pradesh / Telangana for a total period of 10 years from the year
_____to
_____ excluding the periods of study outside the state.

Place: **Signature of the Competent**
Date: **Authority from Revenue Dept.**
Office Seal:

(B) Certificate to be furnished when either of the parents of the candidate has resided in the state for a period of 10 years.
(Read Instructions under 3(b) of Annexure (III) of Instruction Booklet of admission)

This is to certify that Sri/Smt. _____,
Father / Mother of _____
a candidate seeking admission in to professional courses (Engineering stream & Agricultural and medical stream) through
AP   EAMCET   2015   for   the   Academic   Year   2015-15,   is   a   resident
of_____
_____ (Place) in _____(District) of Andhra Pradesh / Telangana for a total period of 10 years from the year
_____to
_____ excluding the periods of study outside the state.

Place: **Signature of the Competent**
Date: **Authority from Revenue Dept.**
Office Seal:

_____
_____
(C) Certificate to be furnished when the parent / spouse is an employee of the
State or Central Government or Quasi- Government Organization.
(Read Instructions under 3(c) and 3(d) of Annexure (III) of Instruction Booklet of admission)

This is to certify that Sri/Smt. _____
Father / Mother of _____
a candidate seeking admission in to professional courses (Engineering stream & Agricultural and medical stream) through
AP EAMCET 2015 for the Academic Year 2015-15, is presently employed in Andhra Pradesh State in the Organization
_____ from _____ till to-date. This Organization is a State / Central / Quasi Government
Organization in the State of Andhra Pradesh / Telangana.
Place:
Date

                                                      Signature of the Issuing Authority
                                                         Designation:
Office Seal:

AP EAMCET – 2015 SYLLABUS

NOTE
- ❖ In accordance to G.O.Ms.No: 16 Edn., (EC) Dept., Dt: 25th Feb' 04, AP EAMCET Committee has specified the syllabus of AP EAMCET-2015 as given hereunder.
- ❖ The syllabus is in tune with the syllabus introduced by the Board of Intermediate Education, A.P., for Intermediate course with effect from the academic year 2012-2013(1st year) and 2013-2014 (2nd year) and is designed at the level of Intermediate Course and equivalent to (10+2) scheme of Examination conducted by Board of Intermediate Education, AP.
- ❖ The syllabus is designed to indicate the scope of subjects included for AP EAMCET - 2015. The topics mentioned therein are not to be regarded as exhaustive. Questions may be asked in AP EAMCET-2015 syllabus to test the student's knowledge and intelligent understanding of the subject.
- ❖ The syllabus is applicable to students of both the current and previous batches of Intermediate Course, who desire to appear for AP EAMCET-2015.

Subject: MATHEMATICS

1) **ALGEBRA:**

a) Functions: Types of functions – Definitions - Inverse functions and Theorems - Domain, Range, Inverse of real valued functions.

b) Mathematical Induction: Principle of Mathematical Induction & Theorems - Applications of Mathematical Induction - Problems on divisibility.

c) Matrices: Types of matrices - Scalar multiple of a matrix and multiplication of matrices - Transpose of a matrix - Determinants - Adjoint and Inverse of a matrix - Consistency and inconsistency of Equations- Rank of a matrix - Solution of simultaneous linear equations.

d) Complex Numbers: Complex number as an ordered pair of real numbers- fundamental operations - Representation of complex numbers in the form a+ib - Modulus and amplitude of complex numbers –Illustrations - Geometrical and Polar Representation of complex numbers in Argand plane- Argand diagram.

e) De Moivre's Theorem: De Moivre's theorem- Integral and Rational indices - nth roots of unity- Geometrical Interpretations – Illustrations.

f) Quadratic Expressions: Quadratic expressions, equations in one variable - Sign of quadratic expressions – Change in signs – Maximum and minimum values - Quadratic inequations.

g) Theory of Equations: The relation between the roots and coefficients in an equation - Solving the equations when two or more roots of it are connected by certain relation - Equation with real coefficients, occurrence of complex roots in conjugate pairs and its consequences - Transformation of equations - Reciprocal Equations.

h) Permutations and Combinations: Fundamental Principle of counting – linear and circular permutations- Permutations of 'n' dissimilar things taken 'r' at a time - Permutations when repetitions allowed - Circular permutations - Permutations with constraint repetitions - Combinations-definitions, certain theorems and their applications.

i) Binomial Theorem: Binomial theorem for positive integral index - Binomial theorem for rational Index (without proof) - Approximations using Binomial theorem.

j) Partial fractions: Partial fractions of f(x)/g(x) when g(x) contains non –repeated linear factors - Partial fractions of f(x)/g(x) where both f(x) and g(x) are polynomials and when g(x) contains repeated and/or non-repeated linear factors - Partial fractions of f(x)/g(x) when g(x) contains irreducible factors.

2) **TRIGONOMETRY:**
a) Trigonometric Ratios upto Transformations : Graphs and Periodicity of Trigonometric functions - Trigonometric ratios and Compound angles - Trigonometric ratios of multiple and sub- multiple angles - Transformations - Sum and Product rules.

b) Trigonometric Equations: General Solution of Trigonometric Equations - Simple Trigonometric Equations – Solutions.

c) Inverse Trigonometric Functions: To reduce a Trigonometric Function into a bijection - Graphs of Inverse Trigonometric Functions - Properties of Inverse Trigonometric Functions.

d) Hyperbolic Functions: Definition of Hyperbolic Function – Graphs - Definition of Inverse Hyperbolic Functions – Graphs - Addition formulae of Hyperbolic Functions.

e)   Properties of Triangles: Relation between sides and angles of a Triangle - Sine, Cosine, Tangent and Projection rules - Half angle formulae and areas of a triangle – Incircle and Excircle of a Triangle.

3) VECTOR ALGEBRA:

a)   Addition of Vectors : Vectors as a triad of real numbers - Classification of vectors - Addition of vectors - Scalar multiplication - Angle between two non zero vectors - Linear combination of vectors - Component of a vector in three dimensions - Vector equations of line and plane including their Cartesian equivalent forms.

b)   Product of Vectors : Scalar Product - Geometrical Interpretations - orthogonal projections - Properties of dot product - Expression of dot product in i, j, k system - Angle between two vectors - Geometrical Vector methods - Vector equations of plane in normal form - Angle between two planes - Vector product of two vectors and properties - Vector product in i, j, k system - Vector Areas - Scalar Triple Product - Vector equations of plane in different forms, skew lines, shortest distance and their Cartesian equivalents. Plane through the line of intersection of two planes, condition for coplanarity of two lines, perpendicular distance of a point from a plane, angle between line and a plane. Cartesian equivalents of all these results - Vector Triple Product – Results.

4) PROBABILITY:

a)   Measures of Dispersion - Range - Mean deviation - Variance and standard deviation of ungrouped/grouped data - Coefficient of variation and analysis of frequency distribution with equal means but different variances.

b)   Probability : Random experiments and events - Classical definition of probability, Axiomatic approach and addition theorem of probability - Independent and dependent events - conditional probability- multiplication theorem and Bayee's theorem.

c)   Random Variables and Probability Distributions: Random Variables - Theoretical discrete distributions – Binomial and Poisson Distributions.

5) COORDINATE GEOMETRY:

a)   Locus : Definition of locus – Illustrations - To find equations of locus - Problems connected to it.

b)   Transformation of Axes : Transformation of axes - Rules, Derivations and Illustrations - Rotation of axes - Derivations – Illustrations.

c)   The Straight Line : Revision of fundamental results - Straight line - Normal form – Illustrations - Straight line - Symmetric form - Straight line - Reduction into various forms - Intersection of two Straight Lines - Family of straight lines - Concurrent lines - Condition for Concurrent lines - Angle between two lines - Length of perpendicular from a point to a Line - Distance between two parallel lines - Concurrent lines - properties related to a triangle.

d)   Pair of Straight lines: Equations of pair of lines passing through origin - angle between a pair of lines - Condition for perpendicular and coincident lines, bisectors of angles - Pair of bisectors of angles - Pair of lines - second degree general equation - Conditions for parallel lines - distance between them, Point of intersection of pair of lines - Homogenizing a second degree equation with a first degree equation in x and y.

e)   Circle : Equation of circle -standard form-centre and radius of a circle with a given line segment as diameter & equation of circle through three non collinear points - parametric equations of a circle - Position of a point in the plane of a circle – power of a point-definition of tangent-length of tangent - Position of a straight line in the plane of a circle-conditions for a line to be tangent – chord joining two points on a circle – equation of the tangent at a point on the circle- point of contact-equation of normal - Chord of contact - pole and polar-conjugate points and conjugate lines - equation of chord with given middle point - Relative position of two circles- circles touching each other externally, internally- common tangents –centers of similitude- equation of pair of tangents from an external point.

f)   System of circles: Angle between two intersecting circles - Radical axis of two circles- properties- Common chord and common tangent of two circles – radical centre - Intersection of a line and a Circle.

g)   Parabola: Conic sections –Parabola- equation of parabola in standard form-different forms of parabola- parametric equations - Equations of tangent and normal at a point on the parabola (Cartesian and parametric) - conditions for straight line to be a tangent.

h)   Ellipse: Equation of ellipse in standard form- Parametric equations - Equation of tangent and normal at a point on the ellipse (Cartesian and parametric)- condition for a straight line to be a tangent.

i)   Hyperbola: Equation of hyperbola in standard form- Parametric equations - Equations of tangent and normal at a point on the hyperbola (Cartesian and parametric)- conditions for a straight line to be a tangent- Asymptotes.

j)   Three Dimensional Coordinates : Coordinates - Section formulae - Centroid of a triangle and tetrahedron.

k)   Direction Cosines and Direction Ratios : Direction Cosines - Direction Ratios.

l) Plane : Cartesian equation of Plane - Simple Illustrations.

6) CALCULUS:
a) Limits and Continuity: Intervals and neighbourhoods – Limits - Standard Limits – Continuity.

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

c) Applications of Derivatives: Errors and approximations - Geometrical Interpretation of a derivative - Equations of tangents and normals - Lengths of tangent, normal, sub tangent and sub normal - Angles between two curves and condition for orthogonality of curves - Derivative as Rate of change - Rolle's Theorem and Lagrange's Mean value theorem without proofs and their geometrical interpretation - Increasing and decreasing functions - Maxima and Minima.

d) Integration : Integration as the inverse process of differentiation- Standard forms -properties of integrals - Method of substitution- integration of Algebraic, exponential, logarithmic, trigonometric and inverse trigonometric functions - Integration by parts - Integration- Partial fractions method - Reduction formulae.

e) Definite Integrals: Definite Integral as the limit of sum - Interpretation of Definite Integral as an area - Fundamental theorem of Integral Calculus – Properties - Reduction formulae - Application of Definite integral to areas.

f) Differential equations: Formation of differential equation-Degree and order of an ordinary differential equation - Solving differential equation by i) Variables separable method, ii) Homogeneous differential equation, iii) Non - Homogeneous differential equation, iv) Linear differential equations.

Subject – PHYSICS

1) PHYSICAL WORLD: What is physics?, Scope and excitement of Physics, Physics, technology and society, Fundamental forces in nature, Gravitational Force, Electromagnetic Force, Strong Nuclear Force, Weak Nuclear Force, Towards Unification of Forces, Nature of physical laws.

2) UNITS AND MEASUREMENTS: Introduction , The international system of units, Measurement of Length, Measurement of Large Distances, Estimation of Very Small Distances: Size of a Molecule, Range of Lengths, Measurement of Mass, Range of Masses, Measurement of time , Accuracy, precision of instruments and errors in measurement, Systematic errors, random errors, least count error, Absolute Error, Relative Error and Percentage Error, Combination of Errors, Significant figures, Rules for Arithmetic Operations with Significant Figures, Rounding off the Uncertain Digits, Rules for Determining the Uncertainty in the Results of Arithmetic Calculations, Dimensions of Physical Quantities, Dimensional Formulae and dimensional equations, Dimensional Analysis and its Applications, Checking the Dimensional Consistency of Equations, Deducing Relation among the Physical Quantities.

3) MOTION IN A STRAIGHT LINE: Introduction, Position, path length and displacement, Average velocity and average speed, Instantaneous velocity and speed, Acceleration, Kinematic equations for uniformly accelerated motion, Relative velocity.

4) MOTION IN A PLANE: Introduction, Scalars and vectors, Position and Displacement Vectors, Equality of Vectors, Multiplication of vectors by real numbers, Addition and subtraction of vectors - graphical method, Resolution of vectors, Vector addition - analytical method, Motion in a plane, Position Vector and Displacement, Velocity, Acceleration, Motion in a plane with constant acceleration, Relative velocity in two dimensions, Projectile motion, Equation of path of a projectile, Time of Maximum height, Maximum height of a projectile, Horizontal range of projectile, Uniform circular motion.

5) LAWS OF MOTION: Introduction, Aristotle's fallacy, The law of inertia, Newton's first law of motion, Newton's second law of motion, Newton's third law of motion, Impulse, Conservation of momentum, Equilibrium of a particle, Common forces in mechanics, friction, Circular motion, Motion of a car on a level road, Motion of a car on a Banked road, Solving problems in mechanics.

6) WORK, ENERGY AND POWER: Introduction, The Scalar Product, Notions of work and kinetic energy : The work-energy theorem, Work, Kinetic energy, Work done by a variable force, The work-energy theorem for a variable force, The concept of Potential Energy, The conservation of Mechanical Energy, The Potential Energy of a spring, Various forms of energy: the law of conservation of energy, Heat, Chemical Energy, Electrical Energy, The Equivalence of Mass and Energy, Nuclear Energy, The Principle of Conservation of Energy, Power, Collisions, Elastic and Inelastic Collisions, Collisions in one dimension, Coeffecent of Restitution and its determination, Collisions in Two Dimensions.

7) SYSTEMS OF PARTICLES AND ROTATIONAL MOTION: Introduction, What kind of motion can a rigid body have?, Centre of mass, Centre of Gravity, Motion of centre of mass, Linear momentum of a system of particles, Vector product of two vectors, Angular velocity and its relation with linear velocity, Angular acceleration, Kinematics of rotational motion about a fixed axis, Torque and angular momentum, Moment of force (Torque), Angular momentum of particle, Torque and angular momentum for a system of a particles, conservation of angular momentum, Equilibrium of a rigid body, Principle of moments, Moment of inertia, Theorems of perpendicular and parallel axes, Theorem of perpendicular axes, Theorem of parallel axes,

Dynamics of rotational motion about a fixed axis, Angular momentum in case of rotations about a fixed axis, Conservation of Angular Momentum, Rolling motion, Kinetic Energy of Rolling Motion.

8) OSCILLATIONS: Introduction, Periodic and oscillatory motions, Period and frequency, Displacement, Simple harmonic motion (S.H.M.), Simple harmonic motion and uniform circular motion, Velocity and acceleration in simple harmonic motion, Force law for Simple harmonic Motion, Energy in simple harmonic motion, Some systems executing Simple Harmonic Motion, Oscillations due to a spring, The Simple Pendulum, Damped simple harmonic motion, Forced oscillations and resonance.

9) GRAVITATION: Introduction, Kepler's laws, Universal law of gravitation, The gravitational constant, Acceleration due to gravity of the earth, Acceleration due to gravity below and above the surface of earth, Gravitational potential energy, Escape speed, Earth satellite, Energy of an orbiting satellite, Geostationary and polar satellites, Weightlessness.

10) MECHANICAL PROPERTIES OF SOLIDS: Introduction, Elastic behaviour of solids, Stress and strain, Hooke's law, Stress-strain curve, Elastic moduli, Young's Modulus, Determination of Young's Modulus of the Material of a Wire, Shear Modulus, Bulk Modulus, Poisson's Ratio, Applications of elastic behaviour of materials.

11) MECHANICAL PROPERTIES OF FLUIDS: Introduction, Pressure, Pascal's Law, Variation of Pressure with Depth, Atmosphere Pressure and Gauge Pressure, Hydraulic Machines, Streamline flow, Bernoulli's principle, Speed of Efflux: Torricelli's Law, Venturi-meter, Blood Flow and Heart Attack, Dynamic Lift, Viscosity, Variation of Viscocity of fluids with temperature, Stokes' Law, Reynolds number, Surface tension, Surface Energy, Surface Energy and Surface Tension, Angle of Contact, Drops and Bubbles, Capillary Rise, Detergents and Surface Tension.

12) THERMAL PROPERTIES OF MATTER: Introduction, Temperature and heat, Measurement of temperature, Ideal-gas equation and absolute temperature, Thermal expansion, Specific heat capacity, Calorimetry, Change of state, Regelation, Latent Heat, Heat transfer, Conduction, thermal conductivity, Convection, Radiation, Black body Radiation, Greenhouse Effect, Newton's law of cooling,

13) THERMODYNAMICS: Introduction, Thermal equilibrium, Zeroth law of thermodynamics, Heat, Internal Energy and work, First law of thermodynamics, Specific heat capacity, Thermodynamic state variables and equation of State, Thermodynamic process, Quasi-static Isothermal Process, Adiabatic Process, Isochoric Process, Cyclic process, Heat engines, Refrigerators and heat pumps, Second law of thermodynamics, Reversible and irreversible processes, Carnot engine, Carnot's theorem.

14) KINETIC THEORY: Introduction, Molecular nature of matter, Behaviour of gases, Boyle's Law, Charles' Law, Kinetic theory of an ideal gas, Pressure of an Ideal Gas, Law of equipartition of energy, Specific heat capacity, Monatomic Gases, Diatomic Gases, Polyatomic Gases, Specific Heat Capacity of Solids, Specific Heat Capacity of Water, Mean free path.

15) WAVES: Introduction, Transverse and longitudinal waves, Displacement relation in a progressive wave, The speed of a travelling wave, The principle of superposition of waves, Reflection of waves, Beats, Doppler effect.

16) RAY OPTICS AND OPTICAL INSTRUMENTS: Introduction, Reflection of Light by Spherical Mirrors, Refraction, Total Internal Reflection, Refraction at Spherical Surfaces and by Lenses, Refraction through a Prism, Dispersion by a Prism, Some Natural Phenomena due to Sunlight , Optical Instruments.

17) WAVE OPTICS: Introduction, Huygens Principle, Refraction and reflection of plane waves using Huygens Principle, Coherent and Incoherent Addition of Waves, Interference of Light Waves and Young's Experiment, Diffraction, Polarisation.

18) ELECTRIC CHARGES AND FIELDS: Introduction, Electric Charges, Conductors and Insulators, Charging by Induction, Basic Properties of Electric Charge, Coulomb's Law, Forces between Multiple Charges, Electric Field, Electric Field Lines, Electric Flux, Electric Dipole, Dipole in a Uniform External Field, Continuous Charge Distribution, Gauss's Law, Application of Gauss's Law.

19) ELECTROSTATIC POTENTIAL AND CAPACITANCE: Introduction, Electrostatic Potential, Potential due to a Point Charge, Potential due to an Electric Dipole, Potential due to a System of Charges, Equipotential Surfaces, Potential Energy of a System of Charges, Potential Energy in an External Field, Electrostatics of Conductors, Dielectrics and Polarisation, Capacitors and Capacitance, The Parallel Plate Capacitor, Effect of Dielectric on Capacitance, Combination of Capacitors, Energy Stored in a Capacitor, Van de Graaff Generator.

20) CURRENT ELECTRICITY: Introduction, Electric Current, Electric Currents in Conductors, Ohm's law, Drift of Electrons and the Origin of Resistivity, Limitations of Ohm's Law, Resistivity of various Materials, Temperature Dependence of Resistivity, Electrical Energy, Power, Combination of Resistors — Series and Parallel, Cells, emf, Internal Resistance, Cells in Series and in Parallel, Kirchhoff's Laws, Wheatstone Bridge, Meter Bridge, Potentiometer.

21) MOVING CHARGES AND MAGNETISM: Introduction, Magnetic Force, Motion in a Magnetic Field, Motion in Combined Electric and Magnetic Fields, Magnetic Field due to a Current Element, Biot-Savart Law, Magnetic Field on the Axis

of a Circular Current Loop, Ampere's Circuital Law, The Solenoid and the Toroid, Force between Two Parallel Currents, the Ampere, Torque on Current Loop, Magnetic Dipole, The Moving Coil Galvanometer.

22) MAGNETISM AND MATTER: Introduction, The Bar Magnet, Magnetism and Gauss's Law, The Earth's Magnetism, Magnetisation and Magnetic Intensity, Magnetic Properties of Materials, Permanent Magnets and Electromagnets.

23) ELECTROMAGNETIC INDUCTION: Introduction, The Experiments of Faraday and Henry, Magnetic Flux, Faraday's Law of Induction, Lenz's Law and Conservation of Energy, Motional Electromotive Force, Energy Consideration: A Quantitative Study, Eddy Currents, Inductance, AC Generator.

24) ALTERNATING CURRENT: Introduction, AC Voltage Applied to a Resistor, Representation of AC Current and Voltage by Rotating Vectors — Phasors, AC Voltage Applied to an Inductor, AC Voltage Applied to a Capacitor, AC Voltage Applied to a Series LCR Circuit, Power in AC Circuit: The Power Factor, LC Oscillations, Transformers.

25) ELECTROMAGNETIC WAVES: Introduction, Displacement Current, Electromagnetic Waves, Electromagnetic Spectrum.

26) DUAL NATURE OF RADIATION AND MATTER: Introduction, Electron Emission, Photoelectric Effect, Experimental Study of Photoelectric Effect, Photoelectric Effect and Wave Theory of Light, Einstein's Photoelectric Equation: Energy Quantum of Radiation, Particle Nature of Light: The Photon, Wave Nature of Matter, Davisson and Germer Experiment.

27) ATOMS: Introduction, Alpha-particle Scattering and Rutherford's Nuclear Model of Atom, Atomic Spectra, Bohr Model of the Hydrogen Atom, The Line Spectra of the Hydrogen Atom, de Broglie's Explanation of Bohr's Second Postulate of Quantisation.

28) NUCLEI: Introduction, Atomic Masses and Composition of Nucleus, Size of the Nucleus, Mass-Energy and Nuclear Binding Energy, Nuclear Force, Radioactivity, Nuclear Energy.

29) SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS: Introduction, Classification of Metals, Conductors and Semiconductors, Intrinsic Semiconductor, Extrinsic Semiconductor, p-n Junction, Semiconductor diode, Application of Junction Diode as a Rectifier, Special Purpose p-n Junction Diodes, Junction Transistor, Digital Electronics and Logic Gates, Integrated Circuits.

30) COMMUNICATION SYSTEMS: Introduction, Elements of a Communication System, Basic Terminology Used in Electronic Communication Systems, Bandwidth of Signals, Bandwidth of Transmission Medium, Propagation of Electromagnetic Waves, Modulation and its Necessity, Amplitude Modulation, Production of Amplitude Modulated Wave, Detection of Amplitude Modulated Wave.

Subject – CHEMISTRY

1) ATOMIC STRUCTURE: Introduction; Sub- atomic particles; Atomic models – Thomson's Model; Rutherford's Nuclear model of atom, Drawbacks; Developments to the Bohr's model of atom; Nature of electromagnetic radiation; Particle nature of electromagnetic radiation- Planck's quantum theory; Bohr's model for Hydrogen atom; Explanation of line spectrum of hydrogen; Limitations of Bohr's model; Quantum mechanical considerations of sub atomic   particles; Dual behaviour of matter; Heisenberg's uncertainty principle; Quantum mechanical model of an atom. Important features of Quantum mechanical model of atom; Orbitals and quantum numbers; Shapes of atomic orbitals; Energies of orbitals; Filling of orbitals in atoms. Aufbau Principle, Pauli's exclusion Principle and Hund's rule of maximum multiplicity; Electronic configurations of atoms; Stability of half filled and completely filled orbitals.

2) CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES: Need to classify elements; Genesis of periodic classification; Modern periodic law and present form of the periodic table; Nomenclature of elements with atomic number greater than 100; Electronic configuration of elements and the periodic table; Electronic configuration and types of elements s,p,d.and f blocks; Trends in physical properties: (a) Atomic radius, (b) Ionic radius (c)Variation of size in inner transition elements, (d) Ionization enthalpy, (e) Electron gain enthalpy, (f) Electro negativity; Periodic trends in chemical properties: (a) Valence or Oxidation states, (b) Anomalous properties of second period elements - diagonal relationship; Periodic trends and chemical reactivity.

3) CHEMICAL BONDING AND MOLECULAR STRUCTURE: Kossel - Lewis approach to chemical bonding, Octet rule, Representation of simple molecules, formal charges, limitations of octat rule; Ionic or electrovalent bond - Factors favourable for the formation of ionic compounds-Crystal structure of sodium chloride, Lattice enthalpy; General properties of ionic compounds; Bond Parameters - bond length, bond angle, and bond enthalpy, bond order, resonance-Polarity of bonds dipole moment; Valence Shell Electron Pair Repulsion (VSEPR) theories; Predicting the geometry of simple molecules; Valence bond theory-Orbital overlap concept-Directional properties of bonds-overlapping of atomic orbitals strength of sigma and pi bonds-Factors favouring the formation of covalent bonds; Hybridisation- different types of hybridization involving s, p and d orbitals- shapes of simple covalent molecules; Coordinate bond -definition with examples; Molecular orbital theory - Formation of molecular orbitals, Linear combination of atomic orbitals (LCAO)-conditions for combination of atomic orbitals - Energy level diagrams for

molecular orbitals -Bonding in some homo nuclear diatomic molecules- H_2, He_2, Li_2, B_2, C_2, N_2 and O_2; Hydrogen bonding-cause of formation of hydrogen bond - Types of hydrogen bonds-inter and intra molecular-General properties of hydrogen bonds.

4) STATES OF MATTER: GASES AND LIQUIDS: Intermolecular forces; Thermal Energy; Intermolecular forces Vs Thermal interactions; The Gaseous State; The Gas Laws; Ideal gas equation; Graham's law of diffusion - Dalton's Law of partial pressures; Kinetic molecular theory of gases; Kinetic gas equation of an ideal gas (No derivation) deduction of gas laws from Kinetic gas equation; Distribution of molecular speeds - rms, average and most probable speeds-Kinetic energy of gas molecules; Behaviour of real gases - Deviation from Ideal gas behaviour - Compressibility factor Vs Pressure diagrams of real gases; Liquefaction of gases; Liquid State - Properties of Liquids in terms of Inter molecular interactions - Vapour pressure, Viscosity and Surface tension (Qualitative idea only. No mathematical derivation).

5) STOICHIOMETRY: Some Basic Concepts - Properties of matter - uncertainty in Measurement-significant figures, dimensional analysis; Laws of Chemical Combinations - Law of Conservation of Mass, Law of Definite Proportions, Law of Multiple Proportions, Gay Lussac's Law of Gaseous Volumes, Dalton's Atomic Theory, Avogadro Law, Principles, Examples; Atomic and molecular masses- mole concept and molar mass. Concept of equivalent weight; Percentage composition of compounds and calculations of empirical and molecular formulae of compounds; Stoichiometry and stoichiometric calculations; Methods of Expressing concentrations of solutions-mass percent, mole fraction, molarity, molality and normality; Redox reactions-classical idea of redox reactions, oxidation and reduction reactions-redox reactions in terms of electron transfer; Oxidation number concept; Types of Redox reactions-combination, decomposition, displacement and disproportination reactions; Balancing of redox reactions - oxidation number method Half reaction (ion-electron) method; Redox reactions in Titrimetry.

6) THERMODYNAMICS: Thermodynamic Terms; The system and the surroundings; Types of systems and surroundings; The state of the system; The Internal Energy as a State Function. (a) Work (b) Heat (c) The general case, the first law of Thermodynamics; Applications; Work; Enthalpy, H- a useful new state function; Extensive and intensive properties; Heat capacity; The relationship between C_p and C_v; Measurement of ΔU and ΔH: Calorimetry; Enthalpy change, $\Delta_r H$ of reactions - reaction Enthalpy (a) Standard enthalpy of reactions, (b) Enthalpy changes during transformations, (c) Standard enthalpy of formation, (d) Thermo chemical equations (e) Hess's law of constant Heat summation; Enthalpies for different types of reactions. (a) Standard enthalpy of combustion ($\Delta_c H^\theta$), (b) Enthalpy of atomization ($\Delta_a H^\theta$), phase transition, sublimation and ionization, (c) Bond Enthalpy ($\Delta_{bond} H^\theta$), (d) Enthalpy of solution ($\Delta_{sol} H^\theta$) and dilution; Spontaneity. (a) Is decrease in enthalpy a criterion for spontaneity? (b) Entropy and spontaneity, the second law of thermodynamics, (c) Gibbs Energy and spontaneity; Gibbs Energy change and equilibrium; Absolute entropy and the third law of thermodynamics.

7) CHEMICAL EQUILIBRIUM AND ACIDS-BASES: Equilibrium in Physical process; Equilibrium in chemical process - Dynamic Equilibrium; Law of chemical Equilibrium - Law of mass action and Equilibrium constant; Homogeneous; Equilibria, Equilibrium constant in gaseous systems. Relationship between K_P and K_c; Heterogeneous Equilibria; Applications of Equilibrium constant; Relationship between Equilibrium constant K, reaction quotient Q and Gibbs energy G; Factors affecting Equilibria.-Le-chatlier principle application to industrial synthesis of Ammonia and Sulphur trioxide; Ionic Equilibrium in solutions; Acids, bases and salts- Arrhenius, Bronsted-Lowry and Lewis concepts of acids and bases; Ionisation of Acids and Bases -Ionisation constant of water and its ionic product- pH scale-ionisation constants of weak acids-ionisation of weak bases-relation between K_a and K_b-Di and poly basic acids and di and poly acidic Bases-Factors affecting acid strength-Common ion effect in the ionization of acids and bases-Hydrolysis of salts and pH of their solutions; Buffer solutions-designing of buffer solution-Preparation of Acidic buffer; Solubility Equilibria of sparingly soluble salts. Solubility product constant Common ion effect on solubility of Ionic salts.

8) HYDROGEN AND ITS COMPOUNDS: Position of hydrogen in the periodic table; Dihydrogen-Occurance and Isotopes; Preparation of Dihydrogen; Properties of Dihydrogen; Hydrides: Ionic, covalent, and non-stiochiometric hydrides; Water: Physical properties; structure of water, ice. Chemical properties of water; hard and soft water, Temporary and permanent hardness of water; Hydrogen peroxide: Preparation; Physical properties; structure and chemical properties; storage and uses; Heavy Water; Hydrogen as a fuel.

9) THE s - BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)
Group 1 Elements : Alkali metals; Electronic configurations; Atomic and Ionic radii; Ionization enthalpy; Hydration enthalpy; Physical properties; Chemical properties; Uses; General characteristics of the compounds of the alkali metals: Oxides; Halides; Salts of oxo Acids; Anomalous properties of Lithium: Differences and similarities with other alkali metals, Diagonal relationship; similarities between Lithium and Magnesium; Some important compounds of Sodium: Sodium Carbonate; Sodium Chloride; Sodium Hydroxide; Sodium hydrogen carbonate; Biological importance of Sodium and Potassium.
Group 2 Elements: Alkaline earth elements; Electronic configuration; Ionization enthalpy; Hydration enthalpy; Physical properties, Chemical properties; Uses; General characteristics of compounds of the Alkaline Earth Metals: Oxides, hydroxides, halides, salts of oxoacids (Carbonates; Sulphates and Nitrates); Anomalous behavior of Beryllium; its diagonal relationship with Aluminium; Some important compounds of calcium: Preparation and uses of Calcium Oxide; Calcium Hydroxide; Calcium Carbonate; Plaster of Paris; Cement; Biological importance of Calcium and Magnesium.

10) p- BLOCK ELEMENTS GROUP 13 (BORON FAMILY): General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties; Important trends and anomalous properties of boron; Some important compounds of boron - Borax, Ortho boric acid, diborane; Uses of boron, aluminium and their compounds.

11) p-BLOCK ELEMENTS - GROUP 14 (CARBON FAMILY): General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties; Important trends and anomalous properties of carbon; Allotropes of carbon; Uses of carbon; Some important compounds of carbon and silicon - carbonmonoxide, carbon dioxide,Silica, silicones, silicates and zeolites.

12) ENVIRONMENTAL CHEMISTRY: Definition of terms: Air, Water and Soil Pollutions; Environmental Pollution; Atmospheric pollution; Tropospheric Pollution; Gaseous Air Pollutants (Oxides of Sulphur; Oxides of Nitrogen; Hydrocarbons; Oxides of Carbon (CO, CO_2). Global warming and Green house effect; Acid Rain- Particulate Pollutants- Smog; Stratospheric Pollution: Formation and breakdown of Ozone- Ozone hole- effects of depletion of the Ozone Layer; Water Pollution: Causes of Water Pollution; International standards for drinking water; Soil Pollution: Pesticides, Industrial Wastes; Strategies to control environmental pollution- waste Management- collection and disposal; Green Chemistry: Green chemistry in day-to-day life; Dry cleaning of clothes; Bleaching of paper; Synthesis of chemicals

13) ORGANIC CHEMISTRY-SOME BASIC PRINCIPLES AND TECHNIQUES AND HYDROCARBONS: General introduction; Tetravalency of Carbon: shapes of organic compounds; Structural representations of organic compounds; Classification of organic compounds; Nomenclature of organic compounds; Isomerism; Fundamental concepts in organic reaction mechanisms; Fission of covalent bond; Nucleophiles and electrophiles; Electron movements in organic reactions; Electron displacement effects in covalent bonds: inductive effect, resonance, resonance effect, electromeric effect, hyperconjugation; Types of Organic reactions; Methods of purification of organic compounds; Qualitative elemental analysis of organic compounds; Quantitative elemental analysis of organic compounds.

HYDROCARBONS
Classification of Hydrocarbons; **Alkanes** - Nomenclature, isomerism (structural and conformations of ethane only); Preparation of alkanes; Properties - Physical properties and chemical Reactivity, Substitution reactions -   Halogenation(free radical mechanism), Combustion, Controlled Oxidation, Isomerisation, Aromatization, reaction with steam and Pyrolysis; **Alkenes-** Nomenclature, structure of ethene, Isomerism (structural and geometrical); Methods of preparation; Properties- Physical and chemical reactions: Addition of Hydrogen, halogen, water, sulphuric acid, Hydrogen halides (Mechanism- ionic and peroxide effect, Markovnikov's, antiMarkovnikov's or Kharasch effect). Oxidation, Ozonolysis and Polymerization; **Alkynes -** Nomenclature and isomerism, structure of acetylene. Methods of preparation of acetylene; Physical properties, Chemical reactions- acidic character of acetylene, addition reactions- of hydrogen, Halogen, Hydrogen halides and water. Polymerization; **Aromatic Hydrocarbons:** Nomenclature and isomerism, Structure of benzene, Resonance and aromaticity; Preparation of benzene. Physical properties. Chemical properties: Mechanism of electrophilic substitution. Electrophilic substitution reactions- Nitration, Sulphonation, Halogenation, Friedel-Craft' alkylation and acylation; Directive influence of functional groups in mono substituted benzene, Carcinogenicity and toxicity

14) SOLID STATE: General characteristics of solid state; Amorphous and crystalline solids; Classification of crystalline solids based on different binding forces (molecular, ionic, metallic and covalent solids); Probing the structure of solids: X-ray crystallography; Crystal lattices and unit cells. Bravais lattices primitive and centred unit cells; Number of atoms in a unit cell (primitive, body centred and face centred cubic unit cell); Close packed structures: Close packing in one dimension, in two dimensions and in three dimensions- tetrahedral and octahedral voids- formula of a compound and number of voids filled- locating tetrahedral and octahedral voids; Packing efficiency in simple cubic, bcc and in hcp, ccp lattice; Calculations involving unit cell dimensions-density of the unit cell; Imperfections in solids-types of point defects-stoichiometric and non-stoichiometric defects; Electricalproperties-conduction of electricity in metals, semiconductors and insulators- band theory of metals; Magnetic properties.

15) SOLUTIONS: Types of solutions; Expressing concentration of solutions - mass percentage, volume percentage, mass by volume percentage, parts per million, mole fraction, molarity and molality; Solubility: Solubility of a solid in a liquid, solubility of a gas in a liquid, Henry's law; Vapour pressure of liquid solutions: vapour pressure of liquid- liquid solutions. Raoult's law as a special case of Henry's law -vapour pressure of solutions of solids in liquids; Ideal and non-ideal solutions; Colligative properties and determination of molar mass-relative lowering of vapour pressure-elevation of boiling point-depression of freezing point-osmosis and osmotic pressure-reverse osmosis and water purification; Abnormal molar masses-van't Hoff factor.

16) ELECTROCHEMISTRY AND CHEMICAL KINETICS:

ELECTROCHEMISTRY: Electrochemical cells; Galvanic cells: measurement of electrode potentials; Nernst equation-equilibrium constant from Nernst equation-   electrochemical cell and Gibbs energy of the cell reaction; Conductance of electrolytic solutions- measurement of the conductivity of ionic solutions-variation of conductivity and molar conductivity with concentration-strong electrolytes and weak electrolytes-applications of Kohlrausch's law; Electrolytic cells and electrolysis: Faraday's laws of electrolysis-products of electrolysis; Batteries: primary batteries and secondary batteries; Fuel cells; Corrosion of metals-Hydrogen economy.

CHEMICAL KINETICS: Rate of a chemical reaction; Factors influencing rate of a reaction: dependance of rate on concentration- rate expression and rate constant- order of a reaction, molecularity of a reaction; Integrated rate equations-zero order reactions-first order

reactions- half life of a reaction; Pseudo first order reaction; Temperature dependence of the rate of a reaction -effect of catalyst; Collision theory of chemical reaction rates.

17) SURFACE CHEMISTRY: Adsorption and absorption: Distinction between adsorption and absorption-mechanism of adsorption-types of adsorption-characteristics of physisorption-characteristics of chemisorptions-adsorption isotherms-adsorption from solution phase-applications of adsorption; Catalysis: Catalysts, promoters and poisons-auto catalysis-homogeneous and heterogeneous catalysis-adsorption theory of heterogeneous catalysis-important features of solid catalysts: (a)activity (b)selectivity-shape-selective catalysis by zeolites-enzyme catalysis-characteristics and mechanism- catalysts in industry; Colloids; Classification of colloids: Classification based on physical state of dispersed phase and dispersion medium-classification based on nature of interaction between dispersed phase and dispersion medium- classification based on type of particles of the dispersed phase- multi molecular, macromolecular and associated colloids- cleansing action of soaps-preparation of colloids-purification of colloidal solutions- properties of colloidal solutions: Tyndal effect, colour, Brownian movement-charge on colloidal particles, electrophoresis; Emulsions; Colloids Around us- application of colloids.

18) GENERAL PRINCIPLES OF METALLURGY: Occurrence of metals; Concentration of ores-levigation, magnetic separation, froth floatation, leaching; Extraction of crude metal from concentrated ore-conversion to oxide, reduction of oxide to the metal; Thermodynamic principles of metallurgy – Ellingham diagram-limitations-applications-extraction of iron, copper and zinc from their oxides; Electrochemical principles of metallurgy; Oxidation and reduction; Refining of crude metal-distillation, liquation poling, electrolysis, zone refining and vapour phase refining; Uses of aluminium, copper, zinc and iron.

19) p-BLOCK ELEMENTS:
GROUP-15 ELEMENTS : Occurrence- electronic configuration, atomic and ionic radii, ionisation enthalpy, electronegativity, physical and chemical properties; Dinitrogen-preparation, properties and uses; Compounds of nitrogen-preparation and properties of ammonia; Oxides of nitrogen; Preparation and properties of nitric acid; Phosphorous-allotropic forms; Phosphine-preparation and properties; Phosphorous halides; Oxoacids of phosphorous
GROUP-16 ELEMENTS: Occurrence- electronic configuration, atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, electronegativity, physical and chemical properties; Dioxygen-preparation, properties and uses; Simple oxides; Ozone-preparation, properties, structure and uses; Sulphur-allotropic forms; Sulphur dioxide-preparation, properties and uses; Oxoacids of sulphur; Sulphuric acid-industrial process of manufacture, properties and uses.
GROUP-17 ELEMENTS: Occurrence, electronic configuration, atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, electronegativity, physical and chemical properties; Chlorine- preparation, properties and uses; Hydrogen chloride-preparation, properties and uses; Oxoacids of halogens; Interhalogen compounds.

GROUP-18 ELEMENTS : Occurrence, electronic configuration, ionization enthalpy, atomic radii, electron gain enthalpy, physical and chemical properties(a) Xenon-fluorine compounds- XeF_2,XeF_4 and XeF_6 -preparation, hydrolysis and formation of fluoro anions-structures of XeF_2, XeF_4 and XeF_6 (b) Xenon-oxygen compounds XeO_3 and $XeOF_4$ - their formation and structures

20) d AND f BLOCK ELEMENTS & COORDINATION COMPOUNDS:
d AND f BLOCK ELEMENTS : Position in the periodic table; Electronic configuration of the d-block elements; General properties of the transition elements (d-block) -physical properties, variation in atomic and ionic sizes of transition series, ionisation enthalpies, oxidation states, trends in the M^2+/M and M^3+/M^2+ standard electrode potentials, trends in stability of higher oxidation states, chemical reactivity and E^0 values, magnetic properties, formation of coloured ions, formation of complex compounds, catalytic properties, formation of interstitial compounds, alloy formation; Some important compounds of transition elements-oxides and oxoanions of metals-preparation and properties of potassium dichromate and potassium permanganate-structures of chromate, dichromate, manganate and permanganate ions; Inner transition elements(f-block)-lanthanoids- electronic configuration-atomic and ionic sizes-oxidation states- general characteristics; Actinoids-electronic configuration atomic and ionic sizes, oxidation states, general characteristics and comparison with lanthanoids; Some applications of d and f block elements.

COORDINATION COMPOUNDS: Werner's theory of coordination compounds; Definitions of some terms used in coordination compounds; Nomenclature of coordination compounds-IUPAC nomenclature; Isomerism in coordination compounds- (a)Stereo isomerism-Geometrical and optical isomerism (b)Structural isomerism-linkage, coordination, ionisation and hydrate isomerism; Bonding in coordination compounds. (a)Valence bond theory - magnetic properties of coordination compounds-limitations of valence bond theory (b) Crystal field theory (i) Crystal field splitting in octahedral and tetrahedral coordination entities (ii) Colour in coordination compounds-limitations of crystal field theory; Bonding in metal carbonyls; Stability of coordination compounds; Importance and applications of coordination compounds.

21) POLYMERS: Introduction; Classification of Polymers -Classification based on source, structure, mode of polymerization, molecular forces and growth polymerization; Types of polymerization reactions-addition polymerization or chain growth polymerization-ionic polymerization, free radical mechanism-preparation of addition polymers-polythene, teflon and polyacrylonitrile-condensation polymerization or step growth polymerization-polyamides-preparation of Nylon 6,6 and nylon 6-poly esters-terylene-bakelite, melamine-formaldehyde polymers; copolymerization-Rubber-natural rubber-vulcanisation of rubber-Synthetic rubbers-preparation of neoprene and buna-N; Molecular mass of polymers-number average and weight average molecular masses- poly dispersity index(PDI); Biodegradable polymers-PHBV, Nylon 2-nylon 6; Polymers of commercial importance-polypropene, polystyrene, polyvinylchloride (PVC), urea-formaldehyde

resin, glyptal and bakelite - their monomers, structures and uses.

22) BIOMOLECULES: Carbohydrates - Classification of carbohydrates- Monosaccharides: preparation of glucose from sucrose and starch- Properties and structure of glucose- D,L and (+), (-) configurations of glucose- Structure of fructose; Disaccharides: Sucrose- preparation, structure; Invert sugar- Structures of maltose and lactose-Polysaccharides: Structures of starch, cellulose and glycogen- Importance of carbohydrates; **Aminoacids:** Natural aminoacids-classification of aminoacids - structures and D and L forms-Zwitter ions; **Proteins:** Structures, classification, fibrous and globular- primary, secondary, tertiary and quarternary structures of proteins- Denaturation of proteins; **Enzymes:** Enzymes, mechanism of enzyme action; **Vitamins:** Explanation-names- classification of vitamins - sources of vitamins-deficiency diseases of different types of vitamins; **Nucleic acids:** chemical composition of nucleic acids, structures of nucleic acids, DNA finger printing biological functions of nucleic acids; **Hormones:** Definition, different types of hormones, their production, biological activity, diseases due to their abnormal activities.

23) CHEMISTRY IN EVERYDAY LIFE: Drugs and their classification: (a) Classification of drugs on the basis of pharmocological effect (b) Classification of drugs on the basis of drug action (c) Classification of drugs on the basis of chemical structure (d) Classification of drugs on the basis of molecular targets; Drug-Target interaction-Enzymes as drug targets (a) Catalytic action of enzymes (b) Drug-enzyme interaction, receptors as drug targets; Therapeutic action of different classes of drugs: antacids, antihistamines, neurologically active drugs: tranquilizers, analgesics-non-narcotic, narcotic analgesics, antimicrobials-antibiotics, antiseptics and disinfectants- antifertility drugs; Chemicals in food-artificial sweetening agents, food preservatives, antioxidants in food; Cleansing agents-soaps and synthetic detergents – types and examples.

24) HALOALKANES AND HALOARENES: Classification and nomenclature; Nature of C-X bond; Methods of preparation: Alkyl halides and aryl halides-from alcohols, from hydrocarbons (a) by free radical halogenation (b) by electrophilic substitution (c) by replacement of diazonium group(Sandmeyer reaction) (d) by the addition of hydrogen halides and halogens to alkenes-by halogen exchange(Finkelstein reaction); Physical properties-melting and boiling points, density and solubility; Chemical reactions: Reactions of haloalkanes (i)Nucleophilic substitution reactions (a) SN^2 mechanism (b) SN^1 mechanism (c) stereochemical aspects of nucleophilic substitution reactions-optical activity (ii) Elimination reactions (iii) Reaction with metals-Reactions of haloarenes: (i) Nucleophilic substitution (ii)Electrophilic substitution and (iii) Reaction with metals; Polyhalogen compounds: Uses and environmental effects of dichloro methane, trichloromethane, triiodomethane, tetrachloro methane, freons and DDT

25) ORGANIC COMPOUNDS CONTAINING C, H AND O (Alcohols, Phenols, Ethers, Aldehydes, Ketones and Carboxylic acids):
ALCOHOLS, PHENOLS AND ETHERS
Alcohols,phenols and ethers -classification; Nomenclature: (a)Alcohols, (b)phenols and (c) ethers; Structures of hydroxy and ether functional groups; Methods of preparation: **Alcohols** from alkenes and carbonyl compounds (reduction and reaction with Grignard reagents); **Phenols** from haloarenes, benzene sulphonic acid, diazonium salts, cumene; Physical propertics of alcohols and phenols; Chemical reactions of alcohols and phenols (i) Reactions involving cleavage of O-H bond-Acidity of alcohols and phenols, esterification (ii) Reactions involving cleavage of C-O bond- reactions with HX, PX_3, dehydration and oxidation (iii) Reactions of phenols- electrophilic aromatic substitution, Kolbe's reaction, Reimer - Tiemann reaction, reaction with zinc dust, oxidation; Commercially important alcohols (methanol,ethanol); **Ethers-**Methods of preparation: By dehydration of alcohols, Williamson synthesis- Physical properties-Chemical reactions: Cleavage of C-O bond and electrophilic substitution of aromatic ethers.

ALDEHYDES AND KETONES
Nomenclature and structure of carbonyl group; Preparation of aldehydes and ketones-(1) by oxidation of alcohols (2) by dehydrogenation of alcohols (3) from hydrocarbons -Preparation of aldehydes (1) from acyl chlorides (2) from nitriles and esters(3) from hydrocarbons-Preparation of ketones(1) from acyl chlorides (2)from nitriles (3)from benzene or substituted benzenes; Physical properties of aldehydes and ketones; Chemical reactions of aldehydes and ketones-nucleophilic addition, reduction, oxidation, reactions due to -
Hydrogen and other reactions (Cannizzaro reaction,electrophilic substitution reaction); Uses of aldehydes and ketones.

CARBOXYLIC ACIDS
Nomenclature and structure of carboxylgroup; Methods of preparation of carboxylic acids (1)from primary alcohols and aldehydes (2) from alkylbenzenes(3)from nitriles and amides (4)from Grignard reagents (5) from acyl halides and anhydrides (6) from esters; Physical properties; Chemical reactions: (i) Reactions involving cleavage of O-H bond-acidity, reactions with metals and alkalies (ii) Reactions involving cleavage of C-OH bond-formation of anhydride, reactions with PCl_5, PCl_3, $SOCl_2$, esterification and reaction with ammonia (iii) Reactions involving-COOH group-reduction, decarboxylation (iv) Substitution reactions in the hydrocarbon part - halogenation and ring substitution; Uses of carboxylic acids.

26) ORGANIC COMPOUNDS CONTAINING NITROGEN:
AMINES
Structure of amines; Classification; Nomenclature; Preparation of amines: reduction of nitro compounds, ammonolysis of alkyl halides, reduction of nitriles, reduction of amides, Gabriel phthalimide synthesis and Hoffmann bromamide degradation reaction; Physical properties; Chemical reactions: basic character of amines, alkylation, acylation, carbyl amine reaction, reaction with nitrous acid, reaction with aryl sulphonyl chloride, electrophilic substitution of aromatic amines-bromination,

nitration and sulphonation.

DIAZONIUM SALTS
Methods of preparation of diazonium salts (by diazotization)
Physical properties; Chemical reactions: Reactions involving displacement of Nitrogen; Sandmeyer reaction, Gatterman reaction, replacement by i) iodiode and fluoride ions ii) hydrogen, hydroxyl and Nitro groups; reactions involving retention of diazo group; coupling reactions; Importance of diazonium salts in synthesis of aromatic compounds.

CYANIDES AND ISOCYANIDES
Structure and nomenclature of cyanides and isocyanides; Preparation, physical properties and chemical reactions of cyanides and isocyanides.

MODEL QUESTIONS – MATHEMATICS

1) The order and degree of the differential equation
$$\frac{d^2 y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 + 2y = \log\left(\frac{dy}{dx}\right)$$ are

   1) 2 and 2   2) 1 and 2
   3) order2 and degree not defined   4) order not defined but degree is 2

2) Match the following :

	List A	List B
(I)	Example of bijective function	(a) $f(x+y) = f(xy)\ \forall\ x,y \in R$
(II)	Example of surjective function	(b) $f(x) = x^2$, f: R→R
(III)	Example of neither surjective nor injective function	(c) $f(x) = 2^x$, f: R→(0,∞)
(IV)	Example of a constant function	(d) $f(x) = x^2$, f: R→(0,∞)
		(e) $f(x) = x^2$, f: (0,∞)→R

The correct match of List (A) from List (B) is

	I	II	III	IV
1)	d	b	e	a
2)	c	d	b	a
3)	a	b	e	d
4)	d	c	b	a

3) If $\sin^{-1} x + \sin^{-1} 2x = \pi/3$, then x=
   1) √3 / 2√7   2) √2 / 3√7   3) √3 / 7√2   4) √2 / 7√3

4) The variance of 30 observations is 3. If each of the observations is multiplied by 3, then the variance of the resulting observations is :
   1) 3   2) 9   3) 27   4) 81

5) If the sum of two positive numbers is k, then the sum of their squares will be minumum, when the numbers are
   1) k/4, k/4   2) k/3, k/3   3) k/2, k/2   4) k,k

6) The inverse of the point (2,3) with respect to the circle $x^2+y^2=16$ is
   1) (32/26, 48/26)   2) (32/√26, 48/√26)
   3) (32/√13, 48/√13)   4) (32/13, 48/13)

MODEL QUESTIONS – PHYSICS

1. A particle starts from origin at t=0 with a velocity of 10 **i** m/s and moves in x-y plane under the action of force which produces a constant acceleration of $(2i + 3j)$ m/s^2. The y – coordinate in meters of the particle at the instant its x-coordinate is 24m becomes
   (1) 12   (2) 6   (3) 18   (4) 3

2. When 0.2 kg of ice at 0^0 C mixed with 0.5 kg of water at $60\ ^0$C in a container , the resulting temperature is $10\ ^0$C. The heat of fusion of ice ($S_{water} = 4.186$ J/kg/K)
   (1) 1.31×10^5 J/kg   (2) 2.62×10^5 J/kg
   (3) 10.46×10^5 J/kg   (4) 5.23×10^5 J/kg

3. 5 bulbs each of 100 W are connected across 220 V power supply for domestic application. If each unit costs Rs. 4 then the cost per day in Rs. is
   (1) 48   (2) 24   (3) 96   (4) 12

4. A solenoid of length 1.0m has a radius of 1cm and is made up of 1000 turns. It carries a current of 2.5 A. The magnitude of the magnetic field inside the solenoid in Tesla is
   (1) $\pi \times 10^{-3}$ (2) $\pi \times 10^{-4}$ (3) $\pi \times 10^{-6}$ (4) $\pi \times 10^{-5}$

MODEL QUESTIONS – CHEMISTRY

1. Which one of the following has stable electronic configuration?
   (1) N   (2) C   (3) F   (4) Al

2. Which one of the following exhibits acidity?
   (1) R-OH   (2) R-CHO   (3) R-X   (4) C_6H_5-OH

3. Assertion (A): Carbonyl compounds undergo nucleophilic addition reactions.
   Reason (R): Carbonyl group is non-polar.
   The correct answer is:
   (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
   (2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
   (3) (A) is true but (R) is not true
   (4) (A) is not true but (R) is true

4. Match the following:

LIST I	LIST II
(A) Packing efficiency in ccp structure	(1) 2
(B) Number of atoms in bcc unit cell	(2) 4
(C) Packing efficiency in simple cubic structure	(3) 52.4%
(D) Number of atoms in fcc unit cell	(4) 68.0%
	(5) 74.0%

The correct answer is:

	(A)	(B)	(C)	(D)
(1)	5	4	3	2
(2)	3	2	1	4
(3)	5	1	3	2
(4)	4	1	2	3

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. **Material to be brought on the date of examination**

   Hall Ticket along with Filled In Online Application Form with duly affixed recent colour photograph attested by Gazetted Officer (or) Principal of the College where candidate has studied the qualifying examination. However, Signature of the candidate and Left Hand Thumb impression is to be filled in the respective spaces provided in the Filled In Online Application form in the presence of Invigilator only.

2. **Other important instructions**

   a. Hall ticket issued to the candidate is an important document. Candidates are required to preserve it carefully.

   b. Hall ticket is not transferable. Any tampering of Hall Ticket will automatically lead to the disqualification of the candidate.

   c. Candidate shall arrive at the examination hall atleast half an hour before commencement of the examination. This will enable the candidate to familiarize himself/herself with the OMR Answer Sheet.

   d. **Candidates will not be allowed to enter examination hall once the examination has commenced.**

   e. Candidates are permitted to use Blue / Black Ball Point Pen only.

   f. Candidates are required to bring the following to the examination hall:

   i) Hall Ticket ii) A good Ball Point Pen (Blue or Black) iii) Filled In Online Application Form and iv) **Attested copy** of Caste certificate **(in case of SC/ST category candidates only)**.

   g. Besides the items listed in Serial No. (2.f) above, the candidate should not bring any other material. **This instruction sheet also should not be brought into the examination hall. Candidates should not bring Log books, Tables, Calculators, Pagers, Cell Phones etc., into the examination hall. Any candidate found in possession of any forbidden material will be sent out of the examination hall**.

   h. **Candidate shall first fill in the details concerning the Question Paper Booklet No. and Booklet Code on the OMR Answer Sheet as well as Nominal Roll. The candidate shall read carefully the instructions before he/she starts answering the questions.**

   i. Candidates must remain seated in their allotted places till the completion of the examination. **In no case they will be allowed to leave the examination hall till the end of the examination. Before leaving the examination hall, the candidates must ensure to return the OMR Answer Sheet to the Invigilator. Candidate is permitted to leave the examination hall only when the Invigilator satisfies with the complete receipt of OMR Answer Sheets and allow the candidates to leave the hall. The candidate will be permitted to carry the Question Paper Booklet along with them after the completion of examination.**

   j. **Every candidate appearing for AP EAMCET – 2015 shall be provided with a specially designed Optical Mark Reader (OMR) response sheet (Answer Sheet), on which the candidate shall have to mark his or her answers and other relevant data. The method of marking the answers is illustrated in this section. Candidates are advised to go through the instructions given for marking the answers and other entries on the Optical Mark Reader (OMR) Answer Sheet thoroughly and practice the same at their residence which should make it easy for them to answer in the examination hall.**

   k. **The Optical Mark Reader (OMR) Answer Sheet should be handled carefully by the candidates. They are advised not to fold, wrinkle or tear the answer sheet under any circumstances. Further, the candidates are advised not to scribble or make any marks on the answer sheet except marking the answers and other relevant data at appropriate places on the answer sheet. Any violation of these instructions will automatically lead to the disqualification of the candidate.**

   l. **i) Candidate shall note that they will not be given under any circumstances a second blank Optical Mark Reader (OMR) answer sheet. Hence, they are advised to be careful while handling their answer sheet.**

   ii) In AP EAMCET – 2015, the Candidate Name, Hall Ticket Number and Photograph are printed by the Convener on OMR answer sheet as per the data provided by the candidate. Candidate shall ensure that whether he/she received his/her own OMR answer sheet or not. If there is any discrepancy in details or damage to the sheet, the same shall be brought to the notice of the Invigilator immediately.

   m. The Question Paper Booklet given to the candidate shall consist of 160 questions (multiple choice type) in three different sections subject wise with four responses given to each question out of which only one response is correct for the given question.

   Candidates shall mark the correct answer in the Optical Mark Reader (OMR) answer sheet by shading in Dark the appropriate circle with Blue / Black Ball Point Pen.

   n. Candidates are required to answer all the questions. All questions carry equal marks. There is no negative mark for incorrect answer.

3. Every candidate has to select Only One Help Line Centre (HLC) of his/her choice for Certificate Verification and Option Entry (at the time of admission). Candidate has to attend for the above HLC chosen. Request for the change of the HLC will not be allowed once chosen.

INSTRUCTIONS TO FILL UP OMR ANSWER SHEET

1. The candidate should follow the INSTRUCTIONS given on the OMR Answer Sheet, Fill up the information and darken all the Relevant Circles on the OMR answer sheet carefully, otherwise the Answer Sheet will be invalid.

2. Use Blue/Black Ball Point Pen only to darken the appropriate circle. Pencil should not be used for darkening the circles.

   - The circles should be darkened fully. Darkening of more than one circle against any question automatically becomes invalid. Darkened circle cannot be changed.

   - A lightly or faintly darkened circle will be treated as a wrong method of marking and will be rejected by the Scanner.

   - There will be four responses for each question in **AP EAMCET-2015** Examination. The candidate has to indicate the correct response to the question by darkening the appropriate circle completely with Ball Point Pen only.

     For example, Question No. 128 in the Question Paper Booklet reads as follows:

Question No. 128: What is the atomic symbol of Oxygen?

      (1) O   (2) P   (3) Q   (4) R

The correct answer to this question is (1) O. The candidate has to locate the question No. 128 in the OMR Answer Sheet and darken the circle
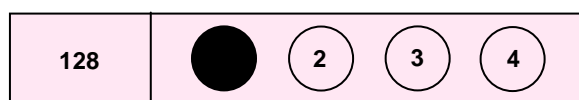
- If the candidate does not want to attempt any question, he/she should not darken the circle given against that question. Please do not fold the OMR Answer Sheet and do not make any stray mark on it.

SOME EXAMPLES OF WRONG/CORRECT WAYS OF MARKING ARE AS FOLLOWS:

S.No.	Bubbling	Response Treated as	Remarks
1	○ ○ ● ○	3	Response is Valid
2	○ 🔵 ○ ○	2	Invalid Response, as other than **black color** is used for bubbling.
3	○ ○ ○ 🔴	0	Invalid Response, as other than **black color** is used for bubbling.
4	◐ ○ ○ ○	0	Invalid Response as **pencil** is used for bubbling
5	◖ ○ ○ ○	0	Invalid Response, as bubble is not fully filled
6	○ ○ ◉ ○	0	Invalid Response, as bubble is not fully filled
7	○ ○ ◉ ○	0	Invalid Response, as bubble is not fully filled
8	○ ⊗ ○ ○	0	Invalid Response, as tick mark (√) is not allowed and treated as partially filled
9	○ ○ ⊗ ○	0	Invalid Response as X is not allowed and treated as partially filled
10	● ○ ● ○	5	Invalid Response as more than one Response √ and X is not valid
11	○ ◉ ◉ ○	0 (or) 5	Invalid response, as bubbling is done in more than two and also partially filled
12	○ ○ ● ⊗	5	Invalid Response and treated as bubbled in more than one
13	◉ ● ○ ○	5	Invalid Response and treated as bubbled in more than one
14	●⟋ ○ ○ ○	5	Invalid Response as bubble is extended to another circle
15	○ ○ ○ ⊛	0	Invalid Response, as bubbling is not done properly
16	○ ○ ○ ○	0	Invalid Response, as Response is NULL
17	● ● ● ●	5	Invalid Response as more than one bubbled
18	◔ ○ ● ○	5	Invalid response, as one bubble erased and other bubbled

Note: (1) **Response is Valid,** if bubbled only one circle **properly.** i.e. either **1** (or) **2** (or) **3** (or) **4** and if it is correct answer, one mark will be awarded

(2) If response is **0** (or) **5,** it is treated as **Invalid Response** and awarded **(0)** ZERO MARKS

(3) Even if there are two answers, only one should be bubbled (most appropriate), If two are bubbled, it will be treated as INVALID.

3. **Changing an answer is NOT ALLOWED**

● The candidates must fully satisfy themselves about the accuracy of the answer before darkening the appropriate circle with Blue / Black ball point pen, as it is not possible to change or erase once darkened.

● Use of Eraser or White Fluid on the Answer Sheet is not permissible as the Answer Sheets are machine gradable and it may lead to wrong evaluation.

4. Marking of SEX and Category: If the candidate is Male and belongs to BC-A category, darken the circle corresponding to Male under SEX and BC - A under category as shown below:

Male	Female
●	○

BC-A	BC-B	BC-C	BC-D	BC-E	SC	ST
●	○	○	○	○	○	○

ANNEXURE – III

DEFINITION OF LOCAL / NON - LOCAL STATUS

1. A Candidate shall be regarded as a local Candidate in relation to a local area (AU/OU/SVU)

    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.

    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

    2.1 If he/she 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 appeared or first appeared for 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 studied for the maximum period out of period of seven years.

OR

        ii. Where 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 examination, he/she has 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

        ii. Where the period of his/her residence in two or more local areas is equal such local area where he/she had resided last in such periods.

Note: 1. Local area in respect of Andhra University (A.U. area) includes Nagarjuna University area. In respect of Sri Venkateswara University (S.V.U. area), it includes Sri Krishnadevaraya University area. In respect of Osmania University (O.U. area), it includes Kakatiya University area.

2. The Candidate belonging to PIO / OCI category will be considered as under non local category only.

3. Candidates coming under any of the categories given below and not satisfying the conditions mentioned in 1 or 2 above are treated as 'Non-Local' to all the three University areas specified above.

    a. Candidates who have resided in the state of A.P. for a total period of 10 years or more excluding the period of study outside this state.

OR

b. Candidates either of whose parents has resided in this state for a total period of 10 years or more excluding the periods of employment outside the state

OR

c. Candidates either of whose parents is employed in the State of A.P. or Central Government Public Sector Corporations, Local Bodies, Universities and other similar quasi Government Institutions within this state, at the time of submitting the application

OR

d. Candidates who are spouses of those employed in the State of A.P. or Central Government, Public Sector Corporations, Local Bodies, Universities and other similar quasi Government Institutions within this state, at the time of submitting the application.

   For full details refer G.O.No. 646, dated 10.07.1979.

Note: Blank **Proforma III** is provided for submitting relevant information regarding Local/Non-Local status of candidates.

ANNEXURE – IV

CRITERIA FOR RANKING (AP EAMCET – 2015 "E CATEGORY")

As per G.O.Ms.No 73 of Higher Education(EC.2) Department, dated 28-07-2011, the candidates who have secured qualifying marks in AP EAMCET-2015 and candidates belonging to the category of Scheduled Caste and Schedule Tribe, for whom qualifying marks have not been prescribed, shall be assigned ranking in the order of merit on the basis of combined score obtained by giving 75% weightage to the marks secured in AP EAMCET-2015 and 25% weightage to the marks secured in the relevant group subjects namely Mathematics, Physics, Chemistry of the qualifying examination.

For the preparation of merit list, in case of more than one student securing the same combined score obtained as mentioned above, the tie shall be resolved to decide the relative ranking by successively considering the following

i)   The total marks secured in AP EAMCET-2015
ii)   The Marks secured in mathematics in AP EAMCET-2015
iii)   The marks secured in Physics in AP EAMCET-2015
iv)   The Percentage of Aggregate marks secured in the qualifying examination
v)   If the tie still persists, the older (based on date of birth) being given preference over the younger.

The weightage of marks, in case of candidates belonging to the category of Persons of Indian Origin (PIO) / Overseas Citizen of India (OCI) Card Holders, will be decided by a committee constituted by the competent authority.

Information related to NATA (National Aptitude Test in Architecture)
for Admission into Bachelor of Architecture (B.Arch.) in Andhra Pradesh / Telangana

Students with Mathematics as subject of examination inclined to pursue **Bachelor of Architecture (B.Arch.) Course** at undergraduate level shall go through a test called **'NATA' (National Aptitude Test in Architecture)** conducted by National Institute for Advanced Studies in Architecture (NIASA) an Academic Unit of Council of Architecture (COA) (An Autonomous Statutory Body of Government of India under the Architects Act, 1972), New Delhi. An online exam will be conducted between March to September 2013 at designated Test Centers located at colleges / schools of Architecture in India. Updated list of Test centers will be available at the website **www.nata.in** from March-2013 onwards.

The National Aptitude Test in Architecture (NATA) measures the aptitude of the applicant for specific field of study, i.e. **Architecture**. The test measures **drawing** and **observation skills**, **sense of proportion**, **aesthetic sensitivity** and **critical thinking ability** that have been acquired over a long period of time and that are related to specific field of study, i.e. Architecture.

Eligibility for NATA Examination:

Candidates should have passed 10+2 examination conducted by Board of Intermediate Education, Andhra Pradesh / Telangana or any other examination recognized as equivalent there to by the Board of Intermediate Education, Andhra Pradesh / Telangana <u>should have secured not less than 50% marks in the aggregate with Mathematics as subject of examination</u>.

<div align="center">OR</div>

Candidates should have passed three years diploma (10+3) in Engineering / Architecture conducted by the State Board of Technical Education and Training, Andhra Pradesh or its equivalent there to as recognized by State Board of Technical Education and Training, Andhra Pradesh and should have secured not less than 50% marks in the aggregate with Mathematics as subject of examination.

Test Content:

As per the Minimum standards prescribed by Council of Architecture (COA) under the Architects Act, 1972, admission of candidates to first year of 5-year B.Arch. degree course shall be subject to their passing an Aptitude test in Architecture. It is advisable to admit students in the 1st year of 5 years B.Arch. degree course on the basis of marks obtained in the National Aptitude Test in Architecture (NATA) administered by COA, New Delhi.

The test is in two parts. A paper based drawing test for two hours and computer based online aesthetic sensitivity test for one hour.

The Aptitude Test in Architecture shall consist of 2 Parts:

(i) Test –I — Drawing — 100 marks - duration of test: 2 hours

(ii) Test –II — Aesthetic Sensitivity — 100 marks - duration of test: 1 hour

Drawing Test:

This is a two hour paper where candidate has to attempt two questions. One of the questions has two sub questions. The drawing aptitude is judged on the following aspects –

- Ability to sketch a given object proportionately and rendering the same in visually appealing manner.
- Visualizing and drawing the effects of light on the object and shadows cast on surroundings
- Sense of perspective drawing.
- Combining and composing given three dimensional elements to form a building or structural form.
- Creating interesting two dimensional compositions using given shapes and forms.
- Creating visual harmony using colours in given composition.
- Understanding of scale and proportions.
- Drawing from memory through pencil sketch on themes from day to day experiences.

Aesthetic Sensitivity Test:

This is computer based test of one hour where candidate has to answer 40 multiple choice questions.

The aesthetic sensitivity test measures perception, imagination and observation, creativity and communication along with architectural awareness and comprises of –

- Visualising three dimensional objects from two dimensional drawings.
- Visualising different sides of three dimensional objects.
- Indentifying commonly used materials and objects based on their textural qualities.
- Analytical reasoning.
- Mental Ability.
- Imaginative comprehension and expression.
- Architectural awareness.

Award of Rank (Weightage):

The following shall be the weightage:

Architectural Aptitude (Online Exam)   - 50% (Maximum)

Qualifying Examination

(10+2 (or) equivalent with Maths as compulsory subject)   - 50% (Maximum)

i.e. 10+2 OR 10+3 years Diploma recognizes by the Central/ State Governments OR Equivalent.

Note: In order to pass an Aptitude Test in Architecture, a candidate must obtain a minimum of 40% marks in the online exam.

For more details kindly refer the NATA website regularly from March-2015 onwards, websites: **www.nata.in, www.niasa.org** Andhra Pradesh State Council of Higher Education (APSCHE) will issue a separate notification highlighting the Test Centers and other NATA exam details in due course of time.

E

(DO NOT WRITE ANY THING ON THIS SIDE)

EAMCET - 2015
INSTRUCTIONS
(Please read the instructions carefully before filling the OMR Answer Sheet)

1. Hall Ticket Number, Name of the Candidate, Father's Name, Mother's Name, Test Centre Code & Name, Date of Birth, Photograph and Booklet code are printed on the OMR Answer Sheet. Make sure that the OMR Answer Sheet given to you contains your Name, Photograph and other particulars. In case of any discrepancy, the OMR Answer Sheet should be shown to the Invigilator. If the data is wrongly printed, the candidate will be given a Buffer OMR Answer Sheet, where in the candidate is expected to fill all the required details in the appropriate places.

2. In case of a spoiled, damaged, misprinted OMR Answer Sheet return it to the Invigilator and claim a Buffer OMR Answer Sheet, where in you are expected to fill in all the required details in the appropriate places.

3. Before you start answering, Booklet Number should be written in the space provided. The appropriate circles have to be darkened for the Category, Booklet Code and Booklet Number.

    Note: i. Question Paper Booklet code is already printed on the OMR Answer Sheet.
    ii. Verify the Question Paper Booklet Code given to you is same as printed on the OMR Answer Sheet.
    iii. If the candidate fails to darken the correct Booklet Code or leaves it blank, the OMR Answer Sheet may be liable for rejection.

4. Sign on the OMR Answer Sheet in the space provided, make sure that the Invigilator signs in the space provided.

5. OMR Answer Sheet will be machine graded and are processed by electronic means i.e., Computers and scanners. Invalidation of Answer Sheet due to incomplete / incorrect filling of the Answer Sheet will be the sole responsibility of the candidate.

6. Use Black / Blue Ball Point Pen to darken the circles. Pens with any other colors are prohibited. Do not use Pencil or Ink/Gel pen.

7. Do not write or mark outside the demarcated areas on this OMR Answer Sheet as it may invalidate the OMR Answer Sheet. Do not write irrelevant matter or scribble on this sheet. Do not fold, tear, wrinkle or staple this sheet.

8. Changing an answer is NOT ALLOWED :

    ● While answering, choose the BEST alternative answer from the four choices given below the question and darken the same in the corresponding circle in the OMR Answer Sheet. Do not shade more than one circle for a question.

    ● The candidates must fully satisfy themselves about the accuracy of the answer before darkening the appropriate circle, as change of answer is not allowed.

    ● Use of eraser or white fluid on the OMR Answer Sheet is not permitted, as the OMR Answer Sheets are machine gradable and it may lead to invalidation.

9. The candidate has to handover the OMR Answer Sheet to the Invigilator before leaving the Examination Hall.

10. In case of any ambiguity in darkening of circle, the decision of the committee is final.

11. In case you do not follow the above instructions, the OMR Answer Sheet is liable to be REJECTED.

12. Correct/ incorrect way of darkening/shading is shown in the table below for strict compliance :

S No.	Darkening of Circle	Response	Reason
1	○○●○	Valid	Correct way of Darkening
2	○●○○	Valid	Correct way of Darkening
3	◗○○○	Invalid	Darkening of circle is done partially
4	○○○◯	Invalid	Darkening of circle is done partially
5	○○◓○	Invalid	Darkening of circle is done partially
6	○○✓○	Invalid	Tick mark (√) is not allowed and treated as partially darkened
7	○○Ⓧ○	Invalid	Cross mark (X) is not allowed and treated as partially darkened
8	●○○●	Invalid	More than one circle darkened and (√) and X are not permitted
9	○●◦○	Invalid	Darkening is done in more than one circle and also partial
10	○○●◓ˣ	Invalid	Treated as darkened in more than one circle
11	◦●○○	Invalid	Treated as darkened in more than one circle
12	●◗○○	Invalid	Darkening in a circle extended to another circle and treated as darkened in more than one circle
13	○○○◉	Invalid	Darkening is not done properly
14	●●●●	Invalid	More than one circle Darkened
15	◉○●○	Invalid	One darkened circle is erased and other circle is darkened and treated as darkened more than one circle

Note: (1)   **Response is Valid**, if darkened only one circle **properly**, i.e. either **1** (or) **2** (or) **3** (or) **4** and if it is the correct answer, one mark will be awarded.

(2)   Even if candidate feels that there are two answers, only one circle should be darkened (most appropriate). If two circles are darkened, it will be treated as INVALID.

Read the instructions given on SIDE-I carefully before Answering

EAMCET - 2015 (E)
OMR ANSWER SHEET
Date of Birth :

Hall Ticket Number :
Name of the Candidate :
Father's Name :
Mother's Name :
Test Centre Code & Name :

1. Category
○ OC ○ BC-A ○ BC-B ○ BC-C
○ BC-D ○ BC-E ○ SC ○ ST

2. Q.P. Booklet Number

3. Q.P. Booklet Code

4. Shade the Booklet Code (Refer code printed on Q.P. Booklet)

Ⓐ Ⓑ Ⓒ Ⓓ

Signature of the Candidate

Signature of the Invigilator

ANSWERS

DO NOT USE PENCIL, INK / GEL PENS TO SHADE THE CIRCLES

USE BLACK OR BLUE BALL POINT PEN TO SHADE CIRCLES

Black / Blue Ball point pen

Please care for the environment before printing this document.